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COMPUTING, INFORMATION, AND COMMUNICATIONS (CIC) DIVISION • LOS ALAMOS NATIONAL LABORATORY

**Entering the Los Alamos
Computing Environment**

**Determining Network
Requirements**

**Desktop Hardware &
Software**

**Computing in the ICN
Environment**

**Common Computing
Resources & Services**

**Enterprise Information
Applications**

Computer Training

Scientific Computing

**introduction
to computing
@ Los Alamos**

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Foreword

Foreword to the Fourth Edition of *Introduction to Computing at Los Alamos*

When we produced the first edition of *Introduction to Computing at Los*, we designed it to meet the needs of new or novice users of the Los Alamos computing environment, and for those users who needed to use the resources in different ways. There was, at the time, no central source for all of the information that a diversity of computer users would need to become effective users of workstations, networks, application servers, and supercomputers. I believe that the fourth edition still fulfills this need. And this guide is as needed now, as it was then.

In fact, one might have hoped that producing this guide would have become a repetitive business by now. Nothing could be farther from the truth! From one year to the next, we have to change about forty percent of the words.

When you enter the Los Alamos computing environment, you are entering one of the most unique, state-of-the-art, cutting edge computing environments in the world. This environment makes it a continuing challenge to describe the “big picture” to workstation users while helping them “find the details” to access and exploit all of its incredible capabilities.

It is no easy task. Consider these examples: how does one learn about using the World Wide Web, e-mail, local workstation administrative tasks, computer security, the software products from the Electronic Software Distribution system, the authorities needed for the data warehouse, how Crypto cards work, the procedures for Time and Effort, how to take advantage of the parallel processing on Blue Mountain or Nirvana, sending and reading documents across e-mail, how to

get group DCE passwords, where to go for system administration, the recommended Information Architecture standards, what virus software is needed and/or required, how to navigate the LANL Web sites, what the restrictions are on the use of the Web and e-mail, what math libraries are available on the big machines, how do you get a server into the Green, how do you find a server in the Blue, which of the 30 some-odd enterprise information systems do you need to use, and how to access the amazing online library resources, and how to use mass storage or local workstation backups?

And what do you do when you don't know what to do?

Well, for all of that, we hope that this fourth edition will be a significant help. The printed edition is available, as well as a fully implemented Web version. Please read through the information, and don't hesitate to call the CIC Customer Service Center (5-4444) for help. That's what we're here for.



Don Willerton, Group Leader Customer Service Group (CIC-6)

Acronym List

Acronym	Meaning
ACFS	Advanced CFS Interface
ACL	Advanced Computing Laboratory
ACS	Account Control System (for the ICN)
ADSM	Adstar Distributed Storage Manager
AIX	IBM version of UNIX, a computer operating system
ASCI	Accelerated Strategic Computing Initiative
ASCII	American Standard Code for Information Exchange
AT	Applied Technology
BSD	Berkeley Software Design, Inc.
BUS	Business Operations (Division)
CCF	Central Computing Facility
CFS	Common File System
CFSGW	CFS gateway access
CHAMMP	Computer Hardware, Advanced Mathematics, and Model Physics
CGS	Common Graphics System
CIC	Computing, Information, and Communications (Division)
CLAMS	common Los Alamos mathematical software
CPU	central processing/processor unit
CSC	Customer Support Center
CSSO	Computer Systems Security Officer
DCE	distributed computing environment
DEC	Digital Equipment Corp.
DFS	Distributed File System
DGL	Distributed Graphics Language
DLT	digital linear tape
DTG	Designated Training Generalist
DNS	domain name system
DoD	Department of Defense
DOE	Department of Energy
ECI	Export Controlled Information
EDS	Employee Development System
EIA	Enterprise Information Applications
EIS	Employee Information System
ESD	Electronic Software Distribution

FAQ	frequently asked questions
FTP	file transport/transfer protocol
GUI	graphical user interface
HP	Hewlett Packard
HPF	High Performance Fortran
HPSS	high performance storage system
HP/UX	Hewlett Packard version of UNIX
HTML	hypertext mark-up language (for the Internet)
I/O	input/output
IA	Information Architecture
IA	Enterprise Information Applications machine
IB	Enterprise Information Applications machine
ICN	Integrated Computing Network
ICNN	Integrated Computing Network News
IES	Import/Export Service
IMP	Integrated Management Process
IMSL	International Mathematical & Statistics Library
IP	Internet protocol
ISDN	Integrated Services Digital Network
ISSO	Information Systems Security Officer
JIT	just-in-time
LAN	local area network
LANL	Los Alamos National Laboratory
LDAP	lightweight directory access protocol
lhost	your local workstation
LPQ	line printer queue
LPR	line print request
LPRM	line printer/remove files
LSF	Load Sharing Facility
LWW	Library Without Walls
MIMD	multiple instruction, multiple data
MIME	Multipurpose Internet Mail Extensions
MPI	message-passing interface
MPP	massively parallel processor
NFS	network file server
NII	National Information Infrastructure
NOC	Network Operations Center
OCSR	Organizational Computer Security Representative

Acronym List

ONCS	Open Network Compute Server (Cluster)
OT	open transport
PDF	portable document format
PE	processing element
PIN	personal identification number
POP	post office protocol (e-mail)
PAGES	Print and Graphics Express Station
PPAGES	printing command for PAGES file shipper
PPD	PostScript printer description
PPP	point-to-point protocol
PSI	Parallel Storage Interface
PVM	Parallel Virtual Machine
RAID	redundant array of inexpensive drives
RAM	random-access memory
REDI	Remote Electronic Desktop Integration
rhost	remote computer (not your local workstation)
SGI	Silicon Graphics, Inc.
SIMD	single instruction, multiple data
SIRT	Security Incident Response Team
SLIP	serial line Internet interface protocol
SMP	shared memory processor
SNCS	Secure Network Compute Server (Cluster)
SPARC	scalable processor architecture
SRAM	static random access memory
SSH	secure shell
TA-3	Technical Area 3
T3D	massively parallel supercomputer
TCP/IP	transmission control protocol/interface protocol
TIG	terminal Internet gateway
TMC	Thinking Machines Corporation
UID	UNIX user identifier
UNICOS	Cray version of UNIX
URL	universal resource locator (Web address)
VMS	Virtual Memory System
VPN	Virtual Private Network
VR	virtual reality
VTERM	VT100 Terminal Emulation
Web	World Wide Web
WWW	World Wide Web

Section 1: Entering the Los Alamos Computing Environment

About this Publication

The use of computers is an essential part of doing business at Los Alamos. While they enable us to do many more tasks, computers also may present challenges, especially for new and occasional (casual) users. This publication will help make the transition to the Los Alamos computing environment quicker and more productive while reducing stress and confusion. It is designed to provide an overview of the primary computing resources and to serve as a road map to additional information.

The World Wide Web (WWW) is the primary repository for information at the Laboratory. Each section of this publication will provide references to Web locations that will enable you to broaden your knowledge. Later in this publication you will be shown how to set up your Web browser to access a Web URL directly [see p. 5–11].

Within this publication, the Web location is referenced by a Web universal resource locator (URL) such as <http://www.lanl.gov/internal>.

The Los Alamos computing environment can be segmented into several special areas. This publication is composed of the following seven areas to help direct you to those resources that are of primary interest to you:

- Introductory information to help establish terminology, understand your computer security responsibilities, and locate supporting resources such as the various help desk organizations [Section 1].
- How to determine your networking requirements [Section 2].
- Desktop hardware and software support and where and how software distribution and configuration are accomplished. Most users, particularly those of business systems should refer to this section [Section 3].

- Information needed to work in the Integrated Computing Network (ICN) environment and how to use the validation, registration, authentication, and charging mechanisms. Most scientific computing users and those who have explicit networking needs should refer to this section [Section 4].
- Information needed to use the common computing resources at Los Alamos. If you have storage or printing needs, you will find this information helpful [Section 5].
- An introduction to the use of Enterprise Information Applications (EIA) where most administrative computer applications are provided [Section 6].
- Information on computer training classes [Section 7].
- An introduction to the use of scientific computing resources [Section 8].

There are three major types of computing functions at Los Alamos, as follows:

- The “Internet Only” functions enable you to use the Web, get e-mail, run computer programs locally, print to local printers, run desktop software, etc., and don’t have to use an ICN password, a secure identification card, i.e., “token card,” or any other authorizations. This function looks like a home computer that’s tied to the Internet through an Internet provider.
- The “Administrative” functions allow you to access the administrative computers, institutional data, the LANL Data Warehouse, and all of the Enterprise Information Applications, like Time and Effort, Property Database, Employee Information, Data Warehouse, Travel, and many others. You will probably need a token card and an ICN password for these functions.

- The “Compute Server” functions provide you with the large machines like Cray YMP, Silicon Graphics, Inc. (SGI) Origin 2000, and workstation clusters. The descriptive words are “lots of cycles,” “lots of storage,” and “lots of bandwidth.” You’ll need an ICN SecurID card for these.

The computing resources are divided into the “unclassified” and “secure” environments. These are physically separate networks where classified computing can be performed only on the secure side. For the secure side, you’ll need a secure ICN password.

The unclassified network is further separated into an ‘open’ region with minimal access restrictions and a ‘protected’ region that is separated from the external Internet by a protective network ‘firewall’ (filters and proxies that control traffic between the external Internet and the protected region). The open region allows us to maintain public access to public information and to foster our collaborations outside the Laboratory. The protected region allows us to better protect machines that are used for internal purposes. Your desktop computer will almost certainly be connected to the protected network. Beyond this capability, some individuals may need to access the Advanced Computing Laboratory (ACL) for research in advanced computer architectures or networking or to connect with the Grand Challenges programs.

See the ACL Web site at <http://www.acl.lanl.gov>.

You will be sharing the ICN with a large user community that includes Laboratory employees, visiting staff members, and people working at other facilities on diverse research efforts. This user community has a constantly expanding variety of applications and performance requirements that make it necessary to provide support for a wide range of hardware and software.

Many of the resources of the ICN are located at Los Alamos in Technical Area-3 (TA-3), Buildings SM-1498 and SM-132 (the Central Computing Facility—CCF). The ICN and the computing resources it provides are supported and maintained by CIC Division.

Getting Started

To help you get started Tables 1.1. and 1.2. provide a checklist for the resources, facilities, or capabilities you may need. Use the information in this publication to assist in accomplishing these tasks.

Overview of Los Alamos Computing Resources

The ICN is LANL's primary computer network. It provides controlled access to and support for a wide variety of computing resources. These resources generally fall into one or more categories as follows:

- Network services for access to the Internet with support for connectivity to local area networks (LANs) at LANL—permits log-in from dial-up and remote computers;
- Registration services for e-mail, compute servers, and software distribution;
- Common support services such as e-mail distribution, storage, and output routing;
- Business support services for Laboratory-wide administrative systems;
- Large-scale scientific computing; and
- General desktop computing.

Clients and Servers

Servers are computers that perform specialized services for many users or for other computers in the network. The recipient of these services (such as your workstation) is called a "client." There are a variety of servers that perform such functions as computing, security, data storage, information retrieval, e-mail, accounting, and production control.

Compute Servers

Compute servers or workers execute user programs to perform numerical computations that are at the heart of most scientific, engineering, and administrative applications. A variety of compute servers employ different operating systems.

- UNIX (Cellular IRIX) SGI/Origin 2000,
- UNICOS on Cray computers in both the unclassified and secure environments,
- UNIX Sun workstations and front-end processors for the Connection Machine, and
- The Labwide administration applications on machines IA and IB.

The computers are generally identified by a short name such as "theta" or "gamma."

Some computers provide for specialized applications such as those on the IA and IB machines.

Networks

The ICN uses the TCP/IP (transmission control protocol/Internet protocol) originally developed for the Department of Defense (DoD) "ARPANET," which is now the most widely used network protocol. Most vendor and third-party software assumes the presence of TCP/IP.

TCP/IP and the UNIX operating system provide the foundation on which CIC Division has built a distributed computing environment. Because this foundation is constructed from standard hardware and software, ICN users are able to take immediate advantage of the many tools and software applications available from all over the world. Use of these tools permits workstations, supercomputers, and specialized processors to be linked into a single, integrated computing system—the ICN.

The unclassified and secure environments are networked independently, with no connections between them. The unclassified open and protected regions are

connected to each other and the external Internet, though the protected region sits behind a protective firewall.

See the Information Architecture (IA) Security Model summary at <http://www.lanl.gov/projects/ia/summary/sec.html>.

Communications

Communications into the ICN are handled by specialized computers in the CCF that direct, validate, and control your communications to the ICN resources in a way that is almost transparent to you. Both network connectivity and dial-up service are provided.

Central Dial-in Modem Services

The central dial-in modem services permit modem connections to the unclassified protected network. The services support the Internet standard point-to-point protocol (PPP) and accept either token card passcodes or special purpose dial-in passwords.

See this web site <http://www.lanl.gov/projects/ia/stds/ia710320.html>

Common File System (CFS)

The CFS is a large central data storage and retrieval system for the worker computers and distributed processors. CFS is used for long-term and archival storage. CFS is currently being phased out in favor of Network File System (NFS), Distributed File System (DFS), and High Performance Storage System (HPSS).

The Mercury system provides the ability to move unclassified data files between the secure and unclassified CFS in a secure, controlled, and auditable way. Because of some of the ways we have had to implement security requirements, there may be several hours delay when moving data in this manner.

Table 1.1. To prepare for computing at Los Alamos

Action	Reference	A Source for Help
Be sure your personal data is entered into the Employee Information System.	p. 5–6	Your group secretary or CIC-6, 665-4444*
Determine if an ICN password or token card is needed, and submit a validation request form.	p. 4–1	Password office, 665-4444
Define the type of workstation you need.	p. 2–1	Your system administrator or CIC-6, 665-4444
Determine your network connection.	pp. 2–1 through 2–6	Your system administrator or CIC-5 NOC, 667-7423
Determine required networking software and hardware.	pp. 2–1 through 2–6	CIC-6, 665-4444 or CIC-5 NOC, 667-7423
Obtain and install Netscape.	pp. 5–1 through 5–2	CIC-6, 665-4444
Obtain and install e-mail software, for example, Eudora.**	pp. 5–1 through 5–2	CIC-6, 665-4444
Establish “authorities” for Enterprise Information Applications.	p. 6–1	CIC-6, 665-4444
Register for computer training.	p. 7–1 through 7–2	CIC-6, 665-4444
* When you call the phone number for the CIC Customer Service Center (665-4444), listed throughout this document, you will then choose from a menu that will direct you to the most appropriate source to answer your question. [see pp. 1–7 through 1–10]		
** You do not need an ICN password to use e-mail.		

Table 1.2. Upon receiving your ICN password, you may access the Register facility to do the following:

Utility	Reference	A Source for Help
Register your e-mail address.	p. 5–4	CIC-6, 665-4444
Register for a post office protocol (POP) server (Eudora e-mail).	p. 5–4	CIC-6, 665-4444
Register for ICN computer (UNICOS, etc.)	pp. 4–1 through 4–2 and pp. 8–1 through 8–2	CIC-6, 665-4444

Adstar Distributed Storage Manager (ADSM)

ADSM is a file storage and backup service available in both the unclassified and secure networks. It provides automated file backup of workstations and personal computers and has an archival file storage capability for large files. ADSM's file size is limited only by the constraints of the operating system communicating with it and supports all of the desktop platforms here at Los Alamos, including PCs running Windows 3.x, 95 and NT, and OS/2, Apple Macintosh, and virtually every flavor of UNIX workstation. Additionally, ADSM can be used to perform backups of very large databases by using Connect Agents for Oracle, SYBASE, DB/2 and Lotus Notes.

Network File Server (NFS)

The NFS is an ICN service that allows UNIX files to be located remotely and yet appear to be local to compute servers and workstations. NFS promotes distributed computing by allowing data to be computed on supercomputers with results displayed on a workstation without requiring the user to move files. DFS operates similarly to NFS, except that it has stronger authentication and encryption based on the Distributed Computing Environment (DCE) security model.

Import/Export Service (IES)

IES provides a method to move electronic files into and out of the Laboratory securely using popular forms of media. The IES supports 1/2-inch 3480/3490 tapes, 4-mm, 8-mm, 1/4-inch tapes at several densities, and all of the DLT (digital linear tape) formats up to the new DLT IV (35 GB). IES now supports CD-ROM (both read and write capability) and IOMEGA JAZ and ZIP formats. The export function copies entire CFS trees onto media in a "tar" format that can be easily restored to CFS or some other system at a later time. Optionally, IES can write the files in standard PC or Macintosh format. The import function provides for a binary transfer of tape or disk files into CFS.

Print and Graphics Express Station (PAGES)

PAGES provides centrally located hard copy devices such as plotters and high-speed laser printers for your text and graphics output.

High Performance Storage System (HPSS)

HPSS provides a highly scalable, highly parallel hierarchical storage system with improvements in performance and capacity by at least two orders of magnitude. As of this writing, HPSS is currently in transition from being a system with limited availability in user-friendly status to a widely deployed production-quality storage system. For archival storage, HPSS is expected to eventually replace CFS. The Parallel Storage Interface (PSI) is the recommended application for access to HPSS.

To find out the current status and availability, visit the HPSS Web site at <http://storage.lanl.gov/cic11/hpss.html>.

Virtual Private Network (VPN)

VPN enables remote users to connect to the unclassified protected network through the Internet and to operate as if they were located at the Laboratory. Strong encryption is used to protect communications from 'sniffing' by eavesdroppers. A token card passcode or dial-in password is required to connect to the VPN.

Link for more detail: <http://www.nic.lanl.gov/security/firewall/howto/vpn.htm>

Computer Security

Computer security is something we at LANL take seriously. As a Los Alamos computer user, you are required to follow security policy that is set by the U S Department of Energy (DOE). Failure to follow this policy will result in removal of your computing privileges, possible

discipline (administrative reprimand, security infraction, or even termination), and/or prosecution when deemed appropriate. Please know what is required of you!

The ICN is divided into two computing environments to provide flexibility in services and protection for classified and sensitive information. You must always be aware of the environment you are working in and the security level of the material you are working with.

- The unclassified environment is used for processing unclassified and unclassified sensitive data only.
- The secure environment is used for processing secure, classified, and national security material.

All users at LANL are required to have training in computer security. The Information Systems Security Officer (ISSO) and Organizational Computer Security Representative (OCSR) for your organization are responsible for providing your training. If you are unsure who your ISSO and OCSR are, ask your manager.

See this Web site for the ISSO and OCSR in your division: <http://s-5.lanl.gov/compsec/search.htm>

All Laboratory computers, computing systems, and their associated communication systems are to be used only for official business and must be protected in accordance with property protection and security rules. In addition, software must be legally procured, and you must maintain records of ownership, such as proof of license requirements, software documentation, or the original application disks to prove that you are the authorized owner. You must not duplicate or use copyrighted or proprietary software without proper authorization.

File Audits—Your management, OCSR, ISSO, the Security Division, the CIC Division, and the DOE have the authority and the responsibility to audit your files on any computing system used for Laboratory business to ensure that you abide by these rules.

Unrequested Output—If you receive output from the ICN that you did not request (such as hard copy printout or a display on your workstation), contact the ICN Password Office (665-4444, option 1) during normal working hours. Between 5:00 p.m. and 8:00 a.m. (local time) and on weekends/holidays, contact the CCF supervisor (667-4584).

ICN Anomaly Detection—To ensure the security of your ICN computing files and activities, the network is regularly scanned for anomalies (such as a large number of failed log-on attempts). These are investigated and, if deemed suspicious, are called to your attention.

Monitoring—All communications across the unclassified protected firewall are logged and subject to monitoring. All communications within the Laboratory networks are subject to monitoring. Evidence of unauthorized activities is provided to the Laboratory's Internal Evaluations Office, which uses that information in their investigations.

Security Incident Response Team (SIRT)—This team is called when an OCSR or system administrator or user determines that a security situation merits expert investigation and guidance. Report any suspicious activity or actual incident immediately to your OCSR. Your OCSR will, in turn, report it to the Computer Security Group (S-5) where time constraints will be determined for possible incident reporting to DOE/Albuquerque and DOE/Headquarters. If expert investigation and guidance are needed, call SIRT at 667-7423 or send e-mail to lanl-sirt@lanl.gov.

Responsible Use of LANL Computing Resources

LANL computing resources are for "official use only," which means any use justifiable as being related to conducting Laboratory business. Official use includes activities obviously required for one's job, such as engineering computations, scientific research, sharing technical

information for review, comment and information exchange, technical collaboration as part of one's research activities, office correspondence, administrative record keeping, and activities related to the "fabric of the Laboratory", (e.g., setting a lunch meeting via email).

"Unacceptable use"—activities that constitute unacceptable use of Laboratory computers or network facilities include the following:

- Use of government equipment for personal gain (e.g., advertising a home business),
- Use for political purposes (e.g., lobbying),
- Illegal activities (e.g., fraud, embezzlement, theft),
- Unauthorized entry to other computers or networks or distributing viruses,
- Misusing or forging e-mail, or tampering with the Laboratory e-mail system,
- Activities likely to result in embarrassment to the Laboratory or DOE, (e.g., reading or distributing pornography, making libelous statements),
- Any activities explicitly prohibited by LANL policy (e.g., sexual harassment, gambling), and
- Use that interferes with job performance for an unauthorized purpose (e.g., using a Lab laptop to calculate sports statistics or balance a personal checkbook).

User Registration for Security

Each user of Laboratory computing resources must register with the Security Division's Computer Security Group, S-5. The Web page steps the user through the user registration process, asking users about their expected computer processing needs, stating the computer and information protections required, and concluding with a computer security acknowledgement statement. Each user must know the highest level of sensitivity of the information he or she may process in the course of performing normal duties

(refer to the section on Information Protection Regimes below). If you don't know the sensitivity levels for the information you will process on Laboratory computing resources, ask your project leader or group leader.

See this URL for the registration process: <http://www.lanl.gov/Internal/projects/OCSR/UserReg.html>

Protecting Passwords and Token Cards

All ICN passwords and token card personal identification numbers (PINs) must be protected, regardless of whether they are used for unclassified or classified processing. If you are an ICN user, you are responsible for the proper storage and handling of your password and/or token card and PIN. By signing a receipt for your ICN password and/or token card, you agree not to misuse the ICN and to be responsible for activity associated with your user number and password/token card PIN.

ICN passwords and token card PINs for unclassified access are sensitive information and must be handled accordingly. Passwords for classified computing are considered Secret, National Security Information, and if written down, become classified documents. They must be marked and stored according to standard Laboratory procedures for marking and handling classified data.

- DO NOT give anyone your password or token card PIN or allow anyone to use them to gain access to the Laboratory's computers.
- DO NOT leave your password or token card PIN where others may view them. Never tape them to your terminal!
- NEVER store your ICN password or token card PIN on-line or on any computer or terminal.
- If you think your password has been compromised, change it using the ICN Registry or contact the ICN Password Office immediately.

- Token cards may be taken overseas with the appropriate Export Control paperwork from BUS-6.
- If you think your token card PIN has been compromised, call the ICN Password Office to have the token card reset, and then use the ICN Registry to set the PIN.

Responsibilities upon Termination or Transfer

If you terminate or transfer from LANL or a contract organization and are an ICN user, there are several things you need to do.

- Destroy documentation that contains passwords or token card PINs.
- Return token cards to your group office.
- Remove machine authorizations using the Register facility.
- Transfer appropriate e-mail names to another individual.
- Delete or give someone else full access to your files on CFS (your files will not automatically go away when your account is removed from the ICN).
- Update the Employee Information System (EIS) and change codes if transferring.
- The employee should give either the encryption keys for (and location of) work-related data, or the encrypted version of the data (or its location) to the group leader or project leader, or anyone designated by either of them to receive the work-related data.

Use of Government-Owned Personal Computers Off-Site

Government-owned personal computers may be used for Laboratory business off-site when the following conditions are met:

1. Laboratory rules for removing and protecting government property, as applicable, must be followed (Material Management Manual, Section 1).

2. All Laboratory-owned systems processing off-site are subject to the Laboratory's Computer Security Program's policies and procedures.
3. All non-Laboratory-owned systems processing sensitive unclassified information off-site are subject to the Laboratory's Computer Security Program's policies and procedures.
4. Stand-alone off-site systems are for processing unclassified information only.
5. Individuals processing information off-site may be held personally liable financially for its loss, damage, destruction, or unauthorized disclosure while it is in their custody (Laboratory Office Procedures Manual, Section 7-2).
6. All software on Laboratory-owned systems used for off-site processing shall be properly licensed and shall be virus-tested.
7. The use of privately owned software on systems that are processing off-site is permitted if the software is fully licensed and has been virus-tested.
8. Laboratory-owned systems require a software review and virus check when returned to the Laboratory.
9. All Laboratory-owned systems are subject to being called back to the Laboratory for an audit by security and/or management officials.
3. Non-Laboratory-owned systems may not be connected to any other computing or telecommunication resource unless prior written approval is given by organization management and the OCSR. When a non-Laboratory system is connected to a Laboratory computing resource or telecommunication resource, it immediately becomes subject to the Laboratory Computer Security Program's policies and procedures, and a certified Addendum to the Master Computer Protection Plan must be on file with the responsible OCSR.
4. For systems that are to be on-site for 90 days or longer an approved/certified Addendum must be on file with the OCSR, and you must have read and signed the "Users Computer Security Responsibilities" form.
5. Non-Laboratory-owned systems shall not be taken into a technical security area without prior approval from DOE.
6. All software on non-Laboratory-owned systems shall be fully licensed.
7. All software and information on non-Laboratory-owned systems shall be virus-tested. Virus testing shall be performed on a continuing basis.
8. All non-Laboratory-owned systems that are brought on-site are subject to audit by security and/or management officials.

Use of Non-Laboratory Computers On-site

Non-Laboratory-owned microcomputers/word processors (systems) may be brought on-site for Laboratory work when the following conditions are met:

1. Systems are to be used for processing unclassified information only.
2. Each system must have a properly executed "Non-Laboratory-Owned Systems at LANL" form kept with it at all times.

Annual Computer Security Refresher Briefing

Each registered computer user must attend a computer security refresher briefing at least once a year. There are many opportunities throughout the year for obtaining credit for the computer security refresher briefing; users can ask their OCSRs what talks and presentations will satisfy the annual requirement. There is also an online computer security refresher briefing available on the Web. Reading through the online training on the Web will satisfy the annual requirement, and you will receive credit in the

Employee Development System (EDS) automatically. Regardless of how users satisfy the requirement, they should make sure their credit is recorded in the EDS.

See the online computer security refresher briefing at this URL: <http://www.hr.lanl.gov/scourses/All/AnnualSecurityRefresher/page01.asp>.

Transferring Laboratory Computing Equipment

Before releasing computer systems to other Laboratory users or to salvage, users must ensure the media is sanitized of any sensitive information and licensed software. Laboratory management involved in the transfer to other Laboratory users have the latitude to determine the level of sanitization required: overwriting the media three times, deleting any or all files, or none. If licensed software is not removed from the system before transfer to another Laboratory user, the licenses should be transferred to the new user with the equipment.

When transferring computer equipment to salvage, any information media should be sanitized by overwriting three times. A sanitization form must accompany salvaged equipment; your property representative has blank sanitization forms and can assist in filling them out.

More information on sanitizing computing equipment is provided in the Computer Security Handbook, available from the S-5 Computer Security Web site at URL <http://s-5.lanl.gov/compsec/index.htm>.

Three Strikes Policy

To clarify the Laboratory's position on acceptable use of government property, Laboratory Director John Browne has issued a "three strikes, you're out" policy on the use of Laboratory machines to access pornography or gambling sites. If employees are found to be using Laboratory machines for such purposes

- the first time, they will be suspended for one week without pay,
- the second time, they will be suspended for one month without pay,
- the third time, their employment will be terminated.

Remember that Laboratory machines are government property and that all computing activity at the Laboratory is subject to monitoring.

See this URL for more information: <http://w10.lanl.gov/pa/News/020499.html>

Information Protection Regimes

Unclassified information at the Laboratory is protected according to one of four broad "protection regimes" depending on the level of sensitivity and required access control:

Protection Regime 3: Robust Authentication, Authorization, and Encryption is used for unclassified information that requires strong protections [such as Unclassified Controlled Nuclear Information (UCNI) and Applied Technology (AT)].

Protection Regime 2: Robust Authentication and Authorization is used for information that requires access to be restricted to those with demonstrably valid reasons to access the information [such as Export Controlled Information (ECI), and employee medical records and performance evaluations].

Protection Regime 1: Simple Authentication is used for information that can be freely disseminated among the Laboratory community and collaborators, but that is not suitable for official public release (such as works in progress that are not yet ready for publication).

Protection Regime 0: Unrestricted Dissemination is used for information that can be freely disseminated throughout the Laboratory and the external Internet (such as the Laboratory Web home page and the cafeteria menu).

Information owners are responsible for determining the level of protection their information requires, and programmers, authors, and publishers should respect the owners' determinations.

For further details, see the IA Standards—IA-6303: Electronic Information Protection Regimes <http://www.lanl.gov/projects/ia/stds/ia630321.html> and

IA-6304: Detailed Listing of Electronic Information Types <http://www.lanl.gov/projects/ia/stds/ia630421.html>

Protecting Your Machine Against Unauthorized Use

In addition to ensuring that you use your desktop computer for official use, it is important to protect your machine against unauthorized access by other people. If, for example, you leave your machine unprotected when you step out for lunch, then anybody who sits down in front of the machine can have access to everything that is available through your open accounts, active Kerberos tickets, or Web browser.

Various tools for protecting machines are presented in the IA Standard IA-8801: Standard Password Protection for Desktop Computers <http://www.lanl.gov/projects/ia/stds/ia8b0111.html>

Consulting and Training Services

The initial point of contact for any question about CIC computing services is the CIC-6 Customer Support Center—CSC (665-4444). The CSC is made up of seven teams that represent focused areas of service within the LANL computing environment. There is no charge for consulting services, which (with some exceptions) are available Monday through Friday, 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 5:00 p.m. local time. Questions that cannot be answered by one of the teams will be referred to another source. A description of each team follows.

Customer Support

Most questions concerning e-mail registration, ICN validation, the Web, and, Post Office Protocol (POP) servers will be answered at this level.

Voice: 505-665-4444 extension 851

FAX: 505-667-5304

E-mail: cichelp@lanl.gov

ICN Password Office

The Password Office provides ICN passwords and LANL token cards.

Voice: 505-665-4444 , extension 854

FAX: 505-667-9617

E-mail: validate@lanl.gov

Enterprise Information Applications

This team provides consulting for the Enterprise Information Applications (EIA) systems used throughout the Laboratory such as the system that tracks employee development, the system property administrators use for property accounting, or the system for submitting and approving travel expenses, and time and effort. See Table 6.1. for a complete list.

Voice: 505-665-4444, extension 852

FAX: 505-665-6647

E-mail: eiaconsult@lanl.gov



Desktop Team: Standing (L to R): Susan Trujillo, Wanda Dunlop, Bobbie Jo Lovato, Weldon Scoggins, Martha Espinosa, Amy Meilander, Reggie Radcliffe, and Lourdes Martinez. Seated (L to R): Mary Lou Holmes, Joyce Sandoval, Moses Gallegos, and Judy Pippin



Enterprise Information Applications Team: (L to R) Lorena Salazar, Elizabeth Abeyta, Brian Martinez, Vonetta Pompeo, and Mary Billen

ICN Consulting Office

This team provides consulting services on a wide variety of topics that typically relate to scientific or engineering computing as follows:

- Programming languages (in particular FORTRAN and C),
- System libraries,
- Graphics libraries,
- Utilities,
- Command languages,
- Assistance with debugging codes,
- Use of controllers, and
- Network communications.

Voice: 505-665-4444, extension 855

FAX: 505-662-5304

E-mail: consult@lanl.gov



ICN Consulting Office Team: (L to R) Rob Cunningham, Sara Hoshizaki, Jeff Johnson, Dale Leschnitzer, David Kratzer, and Hal Marshall

Training, Development, and Coordination Team

The Training Team offers a variety of training programs to assist you in making the best use of computing resources. The team provides six primary areas of training:

- Designated Training Generalist (DTG):
See Web site <http://www.hr.lanl.gov/training/dtg.html>.
- Accelerated Strategic Computing Initiative (ASCI)
- Communications (e.g., Eudora, Meeting Maker)
- EIA (e.g., Data Warehouse, Employee Information, Travel)
- Advanced technical training (e.g., C++, Java, UNIX)
- Web (e.g., HTML—hypertext markup language, Dreamweaver)

A complete list of training courses and schedule dates is available from the Laboratory's Virtual Training Web site: <http://www.lanl.gov/internal/training/training.html>



Training, Development, and Coordination Team: Standing (L to R): Susan Simonsic, Markus Mueller, Vicki Brown. Seated (L to R): Lisa Gardner, Nikki Gaedecke, Beverly Faulkner, and Leslie Linke

Section 1: Entering the Los Alamos Computing Environment

PC and Macintosh applications training (such as Excel, Windows, etc.) is provided by the University of New Mexico-Los Alamos.

If you are unsure of what kinds of training are available or how you might benefit from training, you are encouraged to call the CIC-6 Training Office for personal consultation.

Voice: 505-665-4444 , extension 850 for PC, extension 853 for Macintosh

FAX: 505-667-5304

E-mail: cic6-train@lanl.gov

Desktop Consulting

The Desktop Consulting Team is available to all LANL employees and contractors for assistance with Macintosh and PC workstations as well as other desktop support.

Voice: 505-665-4444 option 5

FAX: 505-667-5304

E-mail: desktop@lanl.gov, mac-help@lanl.gov, or pc-help@lanl.gov

External Computing

This team provides administrative support to external users.

Voice: 505-665-1517

FAX: 505-667-5304

E-mail: external_computing@lanl.gov

Administrative support for external users is also provided for the Accelerated Strategic Computing Initiative (ASCI).

Voice: 505-667-0261

FAX: 505-667-5304

E-mail: jeanne@lanl.gov

Network Operations Center (NOC)

For network problems, you should call the NOC, 667-7423. If you are uncertain that you have a network problem, call the CSC at 665-4444. The NOC manages the LANL

secure and unclassified Internet, diagnoses and repairs LAN and data communications problems, and is the main point of contact for network customer service. The NOC maintains the host-name-to-address database domain name system (DNS) and other network information services.

The NOC is staffed with technicians who will resolve problems over the phone if possible. The NOC will also dispatch field technicians if required. The NOC implements emergency corrective maintenance if multiple users are affected (trouble ticket escalation). The NOC is staffed from 7:00 a.m. to 5:00 p.m. Monday through Friday and also provides after-hours and weekend on-call technician support.

Voice: 505-667-7423 or after-hours dispatch 667-4585

E-mail: nst@lanl.gov

Trouble ticket logged by E-mail: noc@lanl.gov

The hostmaster adds, changes, and removes information about computers on the LANL networks kept under DNS.

Voice: 505-667-7423

E-mail: hostmaster@lanl.gov

Integrated Computing Network News (ICNN)

The ICNN is designed to support and improve two-way communication between the people in CIC Division who support scientific computing services and our customers who use and pay for these services. This Web site and suite of tools provide important information to the user community and allow the users in turn to enter comments, questions, problems, etc., into the system. CIC-Division has developed the ICNN in close coordination with X-Division to ensure that the features included are important to the user community and of practical value.

ICNN is intended to be a living tool in that it will evolve and change according to user requests and the changes in our computing environment. The ICNN capability is intended to extend and clarify communication among ICN users and maintainers in a way that is truly beneficial to all involved.

If you have suggestions, comments, complaints, or compliments regarding this Web site and its associated functionality, please don't hesitate to let us know! Please send e-mail to icnnfeedback@lanl.gov with your ideas. We appreciate your input and will endeavor to make this site meet your needs as best we can.

The URL for the ICNN is <http://icnn.lanl.gov>.



External Computing Team: (L to R) Jeanne Brueggeman, Lori Kelley, and Ann Dingus

Section 2: Determining Networking Requirements

The Integrated Computing Network (ICN) is an important tool in accomplishing the Laboratory and DOE goal of electronically linking all employees. Full participation in research, development, and administrative activities will increasingly require the kind of electronic access the ICN and the Internet make available to Laboratory employees, associates, and contractors.

The ICN is connected to the Internet, a worldwide collection of computer networks whose users can communicate with one another using a variety of networking applications. If your workstation is a part of the ICN, you can, for example, access remote computer resources, order supplies, access airline schedules, or use the "Information Superhighway" (Internet) to perform a variety of other activities. If you need Internet or ICN access, the following questions must be addressed.

What Type of Workstation Is to Be Used?

There are three primary types of personal workstations that are supported at Los Alamos: PC (and PC clone), Macintosh, and UNIX-based workstations (Sun, SGI, etc.). Call your system administrator or the Customer Support Center (CSC (665-4444) for assistance in determining what type of workstation is best suited for your environment and applications.

What Types of Communication Links Are Available?

There are several types of communication links that may be used to connect to the ICN. Your specific work area may limit your selection. However, depending on the types of applications that are required, you may elect to have upgraded communications installed. Call your system administrator or network manager or the Network Operations Center (NOC) at 667-7423 to

determine what communication is available. CIC-5 can also help you select an appropriate modem if you need a dial-up connection. Table 2.1. describes the primary communication links.

What Communication Hardware/Software Is Needed?

Depending on the type of communication link chosen, your workstation may need the software identified in Table 2.2. Your system administrator or CIC-2 (667-5355) can assist you in selecting, installing, and configuring your network hardware and software.

What Are the Networking Software Requirements?

With the link established and the networking communication installed, you can use Table 2.3. to identify the software that will provide the functions or resources noted.

What Are the Resource Access Requirements?

To access the ICN computers and resources, you will need to have a variety of requirements fulfilled as noted in Table 2.4. Call the CSC (665-4444) or your system administrator for assistance in determining what requirements you need to access specific resources.

Connecting to LANL from Home or Travel

If you are at home or on travel, there are a variety of ways to connect to the ICN, but to take full advantage of ICN services, the minimum connection is PPP over a telephone line. This will give you access to LANL-only services via a LANL Internet Protocol (IP) address. To connect to the ICN with point-to-point protocol (PPP) you will need the following:

- Laptop or home computer with at least a 9600 baud modem,
- Telephone line,
- ICN phone numbers [665-4114 or 888-623-3639 (or 800-665-2762 for hotels that don't recognize 888)]
- ICN password or token card or dial-in password [p. 4-1],
- Installation of TCP applications software (may come with PPP),
- Installation of PPP software [pp. 2-1 through 2-6],
- Configuration of network information for the ICN [p. 2-6.], and
- Establishment of a POP account (to use a POP mail tool like Eudora) [p. 5-4].

For more information see this Web site: <http://c6help.lanl.gov/>

The following list will help you estimate the cost (1999 rates) to connect to the ICN with PPP [see pp. 2-1 through 2-6 for more information about cost]:

- Local dial-up (\$0.015/minute)
- FTS800 dial-up (\$0.105/minute)
- ICN POP account (\$12/month). Some groups maintain their own POP service.
- Software (varies)—commercial software, shareware, and freeware are available through Electronic Software Distribution (ESD) [See Table 2.2).
- Modem (\$150-\$400)
- Installation and configuration (varies)—call CIC-2 (7-5355) for software, Halifax (661-0212) for hardware, or your group's computer support staff.
- Token card (\$77)—good for four years.

For more information on recharge rates see URL: <http://www.nic.lanl.gov/recharge/rates.99.html>

Table 2.1. Type of Communication Link

Link	Data Rate	Description
LAN	10/100 MB	Provides a direct high-speed link (TCP/IP) to the ICN/Internet [see Table 2.2.]
Telephone Dial-up Link	56 kB	Access to the ICN/Internet via common carrier (US West, etc.) to LANL Dial-up Modem Service. Your workstation must use an appropriate emulator [see Table 2.2.]

Table 2.2. ICN Workstation Communication Requirements

Type of Workstation	Type of Connection	Communication Link		
		ISDN 57.6 kB	Dial-up ¹ 56 kB	LAN 10/100 MB
Macintosh	TCP/IP	Free PPP, OT/PPP ² , or remote access	Modem and free PPP, OT/PPP, or remote access	Ethernet connector or card IP/address
Windows 95/NT (PC)	TCP/IP	PPP serial cable	PPP/Modem and serial cable	Ethernet card/IP address
UNIT Platform (Sun, SGI, etc.)	TCP/IP (Ethernet)	N/A	Modem PPPD and Chat ³	Standard hardware and software connectivity

¹ Refer to the following URL for more information: <http://protected.lanl.gov/nst/dialups/modems.html>

² (open transport/point-to-point protocol)

³ Software program that automates the log-in procedure to a PPP server.

Definitions for “Type of Connection”

PPP—Allows ISDN and dial-up connections to work with ICN/Internet protocols. When used, they connect to the ICN through the LANL Dial-Up Modem Service, a special entry point that allows you to perform functions (Telnet/FTP) and applications with Internet hosts.

TCP/IP—Protocol that is typically used as the primary method of communications for Ethernet LANs.

Table 2.3. Workstation Networking Software Requirements

Type of Workstation	Function or Resource	Required Software
Macintosh	Telnet	National Center for Supercomputer Applications (NCSA) Telnet
	FTP ¹	Fetch
	3270 Emulator	TN3270 (requires Mac TCP/IP installed)
	POP	Eudora
	PAGES	Appletalk Zone and PAGES software
	WWW	Netscape 4.x or Internet Explorer
	SSH ²	Data Fellows
	Kerberos	Cygnus
	Thin Client	CITRIX
Windows 95/NT (PC)	Telnet	(Windows 95/NT) Microsoft Telnet.exe
	3270 Emulator	WTN3270 or QWS 3270
	FTP	FTP
	POP	Eudora
	PAGES	PAGES software and net access to PAGES
	WWW	Netscape 4.0 or Internet Explorer
	SSH	Data Fellows
	Kerberos	Cygnus
	Thin Client	CITRIX
UNIX	Telnet	Telnet
	FTP	FTP
	3270 Emulator	X3270
	POP	Netscape 4.0
	PAGES	PPAGES
	WWW	Netscape 4.0
	Thin Client	CITRIX
¹ file transfer protocol		
² secure shell		

Table 2.4. Resource Access Requirements

Application Resource	Access Limited by¹	Authentication (Kerberos)²	Password³ Required
IA (EIA⁴)	Authorities	Yes	Token card passcode
IB (EIA)	Authorities	Yes	Token card passcode
Enterprise server (EIA)	Authorities	Yes	Token card passcode
Web-based (EIA)	Authorities	Yes	Token card passcode
Register	Registration	Yes	Token card passcode
UNICOS⁵/UNIX	Registration	Yes, if Klogin fm wkstn	Token card passcode
POP	Registration	Yes	POP password
PAGES	Valid charge code	Yes from workstation	No
CFS	Valid charge code	Yes from workstation	Must have Kerberos ticket first
Dial-up	Valid charge code	No	Dial-up (RADIUS) password

¹ A definition of each access limitation is in Table 2.5.

² A description of Kerberos Authentication is found on pp. 4-2 through 4-3.

³ A definition of each type of password is in Table 2.6.

⁴ Enterprise Information Applications (formerly Labwide Business Information Systems)

⁵ UNIX-based Cray Operating System



Table 2.5. Description of Access Limitations

Access Limitations	Description
Authorities	The Enterprise Information Applications permit each employee to view only selected portions of business files. Your group leader or the EIA Consulting Office can provide greater access.
Employee Information System	You must have an entry for yourself to register for ICN resources.
Registration	Allows each employee to validate himself/herself on the various ICN resources.
Charge codes	The cost distribution codes to which your computing use is charged. Your group secretary should provide this information.
<i>Note: A definition of each type of password is found in Table 2.6.</i>	

Table 2.6. Type of Passwords

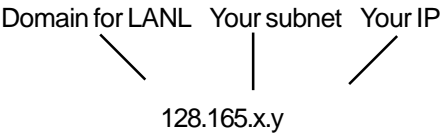
Access Limitation	Description
ICN Password	An eight-character string (issued by the ICN password-generation program or the Password Office) that permits access to ICN resources. There are different passwords for each level of computing (unclassified, secure/classified). Must be changed every six months.
Passcode	A six- or seven-digit number derived from token card that permits access to the administrative partition from workstations in the unclassified environment. Also can be used for access to the unclassified partition.
POP Password	An eight- or less character (user selectable) password selected at the time of POP registration. This is not considered a secure password; therefore, the ICN password must never be used for this. Can be changed by user from most software applications such as Eudora.
Dial-up Password (RADIUS)	An 8- to 16-character password selected via Web-register (http://register.lanl.gov) used solely for access to the Lab dial-up servers. This password must not be the ICN password.

For users who already have Internet access, another option is to use the Virtual Private Network, which establishes encrypted connections to the Laboratory network across the open Internet. Further details are at <http://nicweb.lanl.gov/security/firewall/howto/vpn.html>

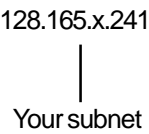
Network Information to Configure for the ICN

When configuring your PC or Mac for network and e-mail access, you will need the information shown in Table 2.7.

LANL IP addresses are configured as follows:



Standard gateway is configured as follows:



Networking Functions

There are several basic networking

functions that permit you to use computing and network resources in remote locations.

- Remote log-ons (Kerberos, SSH, and Telnet) permit you to work through your local workstation (lhost) to a remote host (rhost). Using a workstation windowing environment, you can be logged in to several hosts simultaneously and move between the windows as tasks demand. Refer to the log-in section for information about the log-in process [see pp. 5–2 through 5–3].
- File transfer operations (FTP, CFS, SCP, PSI) allow you to move files between a remote host or file server and your workstation. Refer to the file transfer section for information about these functions [see pp. 5–7 through 5–8].

While these networking functions are usually performed explicitly, they may be embedded in applications and appear transparent. Some of these functions may not be available unless the appropriate software has been installed on your workstation. Additional network applications include e-mail [see pp. 5–3 through 5–6] and the WWW [see pp. 5–11 through 5–12].



Table 2.7. Network IP Addresses

Server	Name	IP Address
Domain name servers	(use IP address)	128.165.4.4 128.165.11.88
Network News (news)	newshost.lanl.gov	(use name)
Time and date (Network Time Protocol)	ntp.lanl.gov	(use name)

Section 3: Desktop Hardware and Software

Desktop Administration

The Desktop Group (CIC-2) provides desktop (PC, Mac, and UNIX), server, and LAN administration for Laboratory customers. We also sponsor a project to apply emerging desktop technology to improve effectiveness and value of Laboratory desktops and LANs. You can reach CIC-2 at 667-5355.

Several Web pages of particular interest to desktop users are as follows:

- CIC-2 Homepage—provides contact information and a resumé of services (<http://int.lanl.gov/orgs/cic/cic2>).
- Electronic Software Distribution (ESD)—the Laboratory source for software (<http://esd.lanl.gov>).
- LANL Information Architecture (IA)—desktop hardware and software standards (<http://www.lanl.gov/ia>).

CIC-2 provides two types of desktop and LAN support for LANL customers. We offer dedicated desktop and network administrators to operate the departmental computing environment for customers on a "Form B" basis. For those customers that do not require dedicated support, we offer as-needed system administration services on a recharge basis.

CIC-2 also sponsors the Remote Electronic Desktop Integration (REDI) project. This project is researching and developing better ways to manage desktops, servers, and LAN systems. The project has two primary focus areas: ESD and SMS. ESD is the Electronic Software Distribution service for the laboratory that allows LANL desktop users to purchase, register, and electronically download or mount software for installation on their computer. SMS is Microsoft software that allows system administrators to automate many desktop management tasks such as hardware and software inventory, automatic unattended

installation of software, and remote management and troubleshooting of desktop systems. By leveraging the IA standards and utilizing emerging commercial software, the REDI team is developing the ability to reduce the total cost of ownership for LANL desktop systems while substantially increasing the value of these tools for the end user.

Desktop Software Standards

The Laboratory IA Project has published a set of software standards for use on all LANL computers. These standards include minimum and recommended hardware specifications for PC, Mac, and UNIX systems. There are software standards specified for the operating system and versions, e-mail clients, Web browsers, file transfers, electronic documents, virus protection, and more. See the IA Web Site: <http://www.lanl.gov/projects/ia/>.

CIC-2 is developing a set of continually evolving support standards designed to facilitate uniform practices and procedures for desktop computer setup, configuration, and end-user support. These standards are intended to guarantee full compatibility and connectivity in the LANL computing environment. They are also designed to increase support efficiency resulting in decreased total cost of ownership of desktop systems at LANL. For additional information, please look at <http://int.lanl.gov/orgs/cic/cic2>.

Software Distribution at LANL

CIC makes IA standard software available at reduced prices through the ESD Web site [see pp. 5–1 through 5–2]. In addition to the adopted standard software, many other software products and upgrades are available at reduced prices and can be immediately installed from the Web.

Software can be purchased through existing just-in-time (JIT) purchasing agreements via the online "Stores" system. Finally,

software can be accessed from various LANL and public software archives such as the /user/lanl/ NFS server (kufssa).

ESD Web Site

Order desktop software and immediately download it to your computer from ESD. You will need a computer with a Web browser installed, token card passcode, or ESD entry password and a charge code. ESD provides services such as software upgrades, returns, and license transfers. To get timely announcements about software and related issues, subscribe to ESD e-mail from the ESD Web site.

Access the ESD Web site at <http://esd.lanl.gov>.

JIT Software Purchasing

The Laboratory has a JIT software contract for purchasing PC and Macintosh software. There are various ways of ordering software through JIT (for help with the online ordering system, call 5-4444). To order by phone, call BUS-4 (7-8673 or 7-4171) or call C. J. Enterprises directly (672-9435). Information about the software packages themselves is available on the Web.

The JIT online catalog and order form are available on the Web at <http://TIPS-JIT.lanl.gov>

Hardware Support

In 1996 the Laboratory partnered with Halifax Corporation for the hardware support of Labs desktop systems. They provide warranty and nonwarranty support of PC, Mac, and printers. You can reach Halifax at 661-0212.

Desktop Phone Consulting

The Customer Service Group (CIC-6) provides phone consulting on many desktop software packages. They can be reached at 665-4444.

Note page . . .



Section 4: Computing in the ICN Environment

While many users will have only a casual and mostly transparent relationship with the ICN, some aspects of the ICN are important for most Los Alamos computer users to understand.

Becoming an ICN User—Validation

Because the LANL network is accessible from the Internet, there is a need to protect it from unauthorized use and abuse.

Among the several layers of protection is the use of token cards, and occasionally, passwords. By requiring the use of a token card, the system can limit access and privilege to different environments and resources of the ICN.

The most common way to access the ICN is with a token card. After initial authentication has taken place with a token card, users may also need to use a password to access specific systems (such as local area networks or dial-ups). Personal computers, e-mail accounts, and storage systems may make use of a secondary, non-ICN, password. Additional information on the generation and security of passwords is contained in the section on security [see p. 1–5].

The most common passwords are the 'ICN password' and the token card (SecurID or CRYPTOCard) passcode, which allow access to the computing and network resources controlled by CIC Division. ICN passwords and token card passcodes also protect access to administrative data that may contain sensitive personnel or business operating information. Different ICN passwords are used in the unclassified and secure environments (so you could have two). Personal computers, e-mail accounts, storage systems, and other servers may make use of secondary passwords.

Note that secure ICN passwords are required in the secure environment, as token card passcodes have not yet been approved for use there (as of this writing). Additional information on the generation and security of passwords is contained in the section on security [see pp. 1–4 through 1–7].

Applying for a Token card or Password

To apply for a token card or password to access the ICN, complete and submit to the ICN Password Office an ICN Validation Request form. This form is available from the following sources.

- The ICN Registry provides access to a portable document format (PDF) file, which requires Adobe Acrobat to view or print. Access the Web site at <http://register.lanl.gov>.
- LANL Online Forms at this URL: <http://iosun.lanl.gov:7000/devl/htmls/forms.html>.
- Group offices.
- ICN Password Office. Call 665-4444, ext. 854 to have a copy faxed or mailed.

New ICN accounts are created immediately upon receipt of your Validation Request. For faster service, FAX or hand carry the request to the Password Office (TA-3, SM-200, Room 257). You must have either a Q or an L clearance to enter this area.

When you receive your token card or password, sign the token card/password receipt and return it to the Password Office via interoffice mail (MS B251) or fax (667-9617). Your token card or password will be activated when the Password Office receives the receipt.

Please read all information included in your token card/password packet to be informed on security issues and your responsibilities as an ICN user. There is also information on how to use the ICN Registry for machine validations and e-mail addresses.

Use of Token Cards

A token card is a credit-card-sized computer that generates passwords, or in token card parlance, "passcodes." Like a desktop computer, it has a keyboard (the set of keys at the bottom of the card), a screen (the small display window at the top), and a microprocessor.

When you receive a token card, it will have a PIN preselected and registered. Each time you key this PIN into your token card it generates a new, unpredictable passcode that is valid for one log-in ONLY. The ICN authenticates the token card based on your token card serial number, your PIN, and the time. Each passcode is only valid for a short time, indicated by the small bars to the left of the passcode with SecurID cards or the display turning off with CRYPTOCards. CRYPTOCards are not time-based.

The capture of passwords, either as they travel through the network or reside in a system file, is an overriding concern in computer security. With the Internet, this risk has grown enormously. A good defense against this threat is a one-time, disposable password—no more password file to "hack" and no more permanent password to "sniff" (or steal) and use illegally.

ICN Password Renewals

ICN passwords must be changed semiannually. Token card passwords are good for the life of the card, whereas, the SecurID password needs to be updated

every four years. The CRYPTOCARD password is valid indefinitely. You can change your password online—either when the password comes up for renewal or at anytime beforehand (if you're concerned your password may have been compromised or "sniffed"). Users have thirty days to change their passwords. Reminder notices are sent to users at ten-day intervals until the password is changed. If the password is not changed within the thirty-day time frame, the account is closed. To reactivate the account the user must complete a new ICN Validation request and submit it to the Password Office. If you have an unclassified ICN password, the Password Office will notify you by e-mail one month before your password expires.

To change your unclassified password:

1. Go to the ICN Registry Web site at this URL: <http://register.lanl.gov>.
2. Choose "Passwords/Token cards," then "Change your ICN password." Follow the prompts.
3. Fifteen passwords will be displayed. Decide on the one you want, and enter both current and new passwords at the prompts. When you select a password, it goes into effect immediately, and your expiration date is moved forward six months.

For secure/classified password renewals, thirty days before a LANL user's secure/classified password is due to expire, the Password Office will send that user a memo indicating that it is time for renewal. If the user has an encrypted line, the password can be changed on-line by following the instructions on the renewal memo. If the user does not have an encrypted line, he/she must go to the Password Office to pick up a new password. Secure/classified password renewals for non-LANL users are mailed to their classified mail channels. These mailings indicate the new password and include a receipt that must be signed and returned to the Password Office before the new password is activated.

Non-LANL Users

LANL also allows non-LANL people to use the ICN. Computing services are generally available, for a fee, to other government agencies. Otherwise, you must be working in collaboration with LANL employees.

If you are not a LANL employee, and you want more information about obtaining an ICN account, call the External Computing Office at (505) 665-1517 or send e-mail to external_computing@lanl.gov.

Registering for ICN Resources

To use specific ICN resources such as e-mail or compute servers, you must be a registered user. The ICN Registry Web site provides a centralized registration function. After receiving your password or token card, you can use the ICN Registry to do the following:

- Change or delete your ICN password.
- Set up or make changes to accounts on ICN compute and file servers.
- Create a new e-mail address or make changes to an existing one.
- Create a new mailing list or make changes to an existing one.
- Access the Recharge System to set up or modify charge codes for specific ICN services.
- View a table showing all your ICN accounts, names, e-mail addresses, etc.
- Create or change your dial-in password.

Access the ICN Registry Web site at <http://register.lanl.gov>.

Within the ICN Registry you may own several names. You may define an e-mail forwarding address and World Wide Web (WWW) URL for each name. Some names have special properties:

- Published name—This name will appear in your LANL phone book listing.
- All your other names (aliases) inherit the published name forwarding address if a forwarding address is not explicitly defined; e-mail to these names will work but will not show up in the phone book listing.
- Log-in/User name—This name is associated with the UID (UNIX user identifier) number; UNIX accounts such as the Cluster and Cray accounts will be created under this name, which must be eight characters or less.

ICN Authentication—Kerberos

To use some ICN resources such as the supercomputing facilities or the CFS, you must identify yourself with your Los Alamos log-in name and ICN password or token card passcode. This process uses the Kerberos authentication facility in which the ICN password is never passed over the network in clear text.

Kerberos verifies your identity when you try to access different ICN resources. It does so through the use of tickets. The ticket allows you to perform many functions such as logging on, executing shell commands, copying files, and retrieving files. These actions can all be performed on remote hosts without the need to send the password or passcode itself across the network.

Under UNIX, Kerberos commands mimic most UNIX commands except that they start with a "k5." For example, you can "k5rlogin," "k5rcp," "k5rsh," etc. You must first request a Kerberos ticket before using any of these features by issuing the "k5init" command. The "k5list" and "k5destroy" commands will list and destroy all Kerberos tickets respectfully. Windows and Macintosh clients add a graphical interface to these commands.

Use of Kerberos involves several important points:

- Kerberos tickets expire after ten hours and may need to be renewed. Existing connections are not affected when tickets expire.
- Kerberos authentication is global, affecting all current and future sessions. If you authenticate yourself in one window, the authentication may affect all windows. If in doubt, you can always use the "k5list" command to verify the active Kerberos authentication.
- The k-commands are used to connect your workstation to ICN resources (such as UNICOS). They do not work from UNICOS to your workstation or between local workstations by default. Your system administrator can tell you if they have been configured locally.

Once you access a resource (such as UNICOS) with a Kerberos command such as "k5login" and you are "authenticated," there is no functional difference between that command and the standard UNIX r-command. The k-commands transparently authenticate and are considerably more secure than standard r-commands.

Charging Policy for ICN Use

Charges are incurred for some CIC services, which include the following:

- UNICOS and Cluster CPU (central processing unit) time, input/output (I/O), and memory use (dependent on the specific system used).
- ICN dial-up communications (including 800 service).
- CFS service charges (dependent on file storage activity and output device).
- PAGES charges (dependent on output activity and output device).
- E-mail accounts.

Most ICN resource charges you accumulate are assigned to the default code defined in the Recharge System. This code consists of a cost center, program code, cost account, work package, and occasionally a voucher ID. For example: 8J0900 W123 0000 0000. The cost center usually relates to your group, while the program code, cost account, and work package identify the specific project.

Use the Recharge System to change charge codes. Access the Web site at <http://recharge.lanl.gov>.

Your ICN charges for a given period can be displayed by accessing the Data Warehouse Web site at <http://datawarehouse.lanl.gov>.



Note page . . .



Section 5: Common Computing Resources and Services

This section acquaints you with common computing resources such as e-mail, WWW, hard-copy printing services, and network information sources. This section shows you how to order software and how to log-on to remote computers. One subsection tells you about the different methods available to transfer files between computers and store files.

Electronic Software Distribution (ESD)

ESD is the Electronic Software Distribution Web site that enables Laboratory personnel to purchase, download, upgrade, or transfer software/software licenses through a desktop computer configured with a Web browser. A convenient and cost-saving tool, ESD provides software at discounted prices through site-licensing and bulk acquisitions.

ESD Log-on

To use ESD, you must have a Z-number, a token card or an ESD entry password, and a charge code.

- Point your Web browser to <http://esd.lanl.gov>.
- Enter your Z-number and token card passcode or ESD entry password on the ESD Entry page.
- Click the Enter button.

Have charge code information ready for software licensing purchases.

Functionality and Services

The following functions and services are available through ESD:

- Purchase and download new software or upgrade at discounted rates.
- Generate a list of your software licenses purchased through ESD.

- Return or transfer software licenses.
- Use the Find & Order button to quickly find particular software.
- Receive software upgrade notices via e-mail.
- Perform a network installation to install software.

License Purchasing

A backbone to ESD services is license purchasing. ESD obtains software licensing at discounted rates through various software companies. These discounts are then passed on to ESD customers. Laboratory personnel can purchase a software license, which then entitles them to legally use the software.

Software Delivery

In addition to selling software licenses, ESD provides several software delivery methods to the Laboratory. To install the software, users have the following options:

- perform a Web download
- perform a Network Installation
- purchase media (CD or floppy disks) for select products through C.J. Enterprises or Computer Corner

ESD Notifications

You will receive automated e-mail regarding upgrades or new releases for only your registered ESD licenses.

Subscribe to ESD e-mail and receive notifications of all new ESD offerings. Log-on to ESD and click the ESD email button to subscribe.

Software Applications versus Software Licenses

To understand ESD, you need to know the fundamental terms that describe software shopping.

Software: computer program that runs an application (i.e. Netscape, MS Word, etc.) To install software, you can download it from the Web, specifically ESD, or you can install it from floppy disks or CDs—borrowed or owned. Regardless of how you install software on your computer, you must purchase a license to be legal. Unlike shrink-wrapped (boxed) software, electronic software does not have a paper license. Instead, electronic software on ESD requires that you buy an electronic license.

License: a certificate that allows you to legally own and use software. You must purchase a license to legally use the software. To use software on your computer without purchasing the license is illegal. For example: if you bought a license for Microsoft Office, installed the software, and your computer crashed, you can reinstall the software without making another license purchase; your purchased license entitles you to run and use the software.

Your Licenses Button: an ESD tool that maintains a record of all your licenses purchased only through ESD. During an audit period, you can print a list of your licenses to prove that you legally own the software. The button is located on the ESD Main page.

Web Download versus Net Install

A *Web download* is the process where a user can copy files from one computer to another computer using a Web browser.

Specifically, you will download the software file from the ESD server to your computer once you click on the software download hyperlink. Downloadable files have special file extensions that tell you that 1) the file can be downloaded, and 2) the file is compressed and how it was compressed. For example, ESD downloadable files will have a .hqx extension for Mac files and an .exe extension for Windows files.

After you save your downloaded file to your directory, you still must run the software installer file that will begin the installation process.

A *Net Install* (network installation) is a special and unique way to install software over the network. After correctly configuring your computer, you can install software quicker and easier through a Net Install (network installation) than through a Web download. For a Net Install to work, you must connect your computer to the ESD server. With the server connection, you can copy files or run software installers directly over the network without accessing the ESD Web site.

Also, a Net install is faster than a Web download software installation, and it eliminates the need for local hard disk space to hold interim files. Instructions to perform either a Web download or a Net Install are located on ESD.

Getting Help

For assistance with ESD you have the following options:

- E-mail esdmaster@lanl.gov
- Access the ESD Online Tutorial through the *How to Use ESD* button
- Call the CIC-6 Desktop Consultants at 5-4444 option 5 for download assistance and questions about Information Architecture products.

Logging-on to Remote Computers

Remote log-ons allow you to log in to another computer from your lhost (local), executing programs and accessing services as though you were sitting at that rhost (remote). (Networked computers are often referred to as “hosts” in much of the supporting documentation). The log-on process may differ depending on the type of workstation being used and the method of connection. The following is a description of some of the log-on methods currently available: TCP/IP connections using Telnet, dial-in modems, Kerberos, SSH (Secure Shell), and Virtual Private Network (VPN).

Telnet Log-on

Telnet can be used to log on directly to TCP/IP hosts. Under UNIX, type:

```
k5init
telnet [ rhost]
```

where rhost is the remote host name. Windows and Macintosh clients add a graphical interface to this command. The following is a sample log-on session.

```
% telnet host name
Trying 128.165.220.1...
Connected to host
name.lanl.gov.
Escape character is '^]'.
Cray UNICOS (host name)
(ttyp007)
login: abc
ICN Password or Passcode
[ 012345]: (echo suppressed)
Last successful login was :
Wed Feb. 28 12:46:47 from
abc.lanl.gov
Logon Compartment = NULL
host name%
```

If the Telnet command is used without arguments (or fails to make the desired connection), it enters the command mode, shown by the prompt TELNET>. Enter “exit” or “logout” to disconnect the telnet session.

Kerberos and SSH can also be used to provide encrypted log-ons to machines that support them.

Central Dial-in Modem Service

The central dial-in modem service permits access to Internet hosts via dial-up connections at (505) 665-4114 or 1-(888) 623-3639, or 1-800-665-2762. To configure your machine see “Dialing into LANL” at this CIC-6 Website: <http://c6help.lanl.gov>. To log in via dial-up, select the appropriate number and respond to the prompts. When prompted for a password, use either a token card passcode or the special purpose dial-in password. (See Table 2–4.)

After the connection is established, you can make connections to a host by simply running your client software. For example, to reach the Web, simply start up your browser (e.g., Netscape) and use it as you normally do.

Remote Log-on—k5rlogin

Remote Log-on “k5rlogin” uses Kerberos tickets obtained with a “k5init” command, which is used on most UNIX servers. Therefore, when you use “k5rlogin,” there is no request for a password.

Remote Log-on—k5login and k5telnet

To log in with either k5login or k5telnet, first obtain a Kerberos ticket with the “k5init” command and your ICN password. You can then use “k5login” or “k5telnet” to login to machines without being prompted for a password. “k5login” is only available for UNIX. “k5telnet” is available for Mac and Windows. All Kerberos software is available from ESD.

Remote Log-on—Secure Shell (SSH)

You can also use SSH to log in. SSH establishes an encrypted tunnel between your machine and the remote host

through which Telnet, FTP, e-mail, and other connections can be safely established. If you are using UNIX and have run “k5init” first, SSH will not prompt you for a password; otherwise you will be asked for your password on the remote machine. SSH for UNIX is included with the UNIX Kerberos distribution on ESD. The Mac and Windows versions are available separately on ESD. For more information on how to use SSH to connect to the Laboratory network from off site, see the SSH how-to page at <http://www.firewall.lanl.gov/howto/ssh.html>.

Website: esd.lanl.gov

Virtual Private Network (VPN) Connections

Virtual Private Network (VPN) connections allow users at remote locations (e.g., Nevada) to connect to the Laboratory network across the Internet. An encrypted ‘tunnel’ is established to prevent eavesdropping by others. As long as the remote user is connected to the VPN, all communications from his/her machine pass through the tunnel and into the Laboratory network. For further details, see <http://nicweb.lanl.gov/security/firewall/howto/vpn.html>.

Connecting from Off Site

The protective firewall around the Laboratory unclassified protected network imposes restrictions on ways that off-site users can connect to Laboratory machines. In general, the firewall requires secure authentication to a proxy or portal machine before access is granted to machines within the protected network. For up-to-date information about how to connect from off site, including instructions for establishing accounts for off-site collaborators, refer to the Laboratory Firewall Page at <http://www.firewall.lanl.gov/>.

Electronic Mail (E-mail)

Concepts and Etiquette

Use e-mail to exchange information with other users over networks such as the Internet (unclassified partition only). Although e-mail appears instantaneous,

- Messages may not be immediately posted to a recipient,
- The recipient may not be logged on to the system, or
- The recipient may be busy with other tasks.

To use the e-mail system effectively, choose your words carefully, and

- Log on at least once each day to read your mail,
- Compose single-subject messages whenever possible,
- Define an appropriate “subject” line (avoid using “FYI!”),
- Assume that any message you send is not secure and will live on indefinitely,
- Know who your intended audience is and establish an appropriate level of formality,
- Keep the list of recipients and “CCs” to a minimum,
- Identify yourself and your affiliations clearly, and
- Know when NOT to use e-mail; consider face-to-face, phone, or paper.

Most e-mail systems communicate using character sets (a text-only character format). If you must send binary data or formatted data (such as Adobe Acrobat PDF), encode the message with Multipurpose Internet Mail Extensions (MIME) when sending it. Some mail readers cannot process these types of files. Avoid sending anything but ASCII files unless you know that your recipient can handle them. Insert carriage returns every 60 characters or so. Don’t depend on your terminal hardware carriage return to generate new lines—it probably doesn’t.

Functionality

The following functions are available in most e-mail systems:

- Receive and read mail;
- Create and reply to mail;
- Save, delete, or hold incoming mail;
- Establish distribution lists;
- Forward e-mail to others;
- Provide travel/vacation advisement; and
- Find e-mail addresses.

Forwarding E-mail

All supported mail services allow mail to be forwarded to another address. You may have several systems on which you can receive mail but choose one that you prefer to read and log your mail. You can establish a forwarding flag on each of the systems on which you do not want to read mail. Call 665-4444 to establish forwarding for CIC servers.

Sending Attachments—Document Conversion

E-mail attachments allow people to easily share formatted files such as graphics, spreadsheets, and documents across different platforms and across the globe more easily than ever before. However, there are problems associated with such transfers. It is a good idea to keep the attachment file size under 5 MB because receivers may have problems downloading large attachments.

Multipurpose Internet Mail Extensions

E-mail is sent across the network in ASCII text format. When you need to send a binary attachment (such as a Microsoft Excel spreadsheet), it must be converted into ASCII by your e-mail software. The most widely used encoding scheme is MIME, and MIME should be used in all cases.

When you attach a file to an e-mail message, your e-mail program converts the file to ASCII format. When your e-mail arrives at its destination, the mail package on the other end converts the file back to its original format. To use MIME in Eudora 4.x, look under Tools/Options/Attachments, and make sure MIME is selected for the encoding method.

Note that some file attachments cannot be read by the recipients even if their e-mail software has successfully decoded the MIME. For example, newer versions of Microsoft Word cannot be read by UNIX machines. If you need to send a formatted file to recipients on a variety of machines, consider using Adobe Acrobat to convert the file into PDF (Portable Document Format) before sending it. To reach the widest audience it is still best to use plain text messages. It is a good idea to keep the attachment file size to a minimum because recipients may have trouble downloading large attachments.

Choosing an E-mail Service

POP and UNIX e-mail services are supported at Los Alamos. The choice usually depends on the type of workstation you use, the network connectivity available, and the e-mail interaction you have with your working group.

CIC offers an Internet account that includes e-mail. You may use the Eudora POP client from your workstation or log in to the server directly using telnet, SSH, or Kerberos [see pp. 5–2 through 5–3] and then run Pine or UNIX mail.

When using POP, your e-mail is stored on the POP server until you call for it. You need a TCP/IP connection (LAN or PPP) to use the POP client and Eudora loaded on the client.

For many users the choice is simply one of personal preference. All of the supported systems can e-mail to each other and to e-mail addresses outside the Lab. The following descriptions may help you decide which is best for you.

Eudora (POP E-mail Service)

Eudora is the IA standard application for e-mail for Mac or PC Windows that employs icons and point-and-click operations. Both LAN and dial-up connections may be used to connect to the POP server where your mail is stored until you call for it. A local Eudora password is used that can be changed by you. A complete set of instructions for using Eudora is on the Web at <http://c6help.lanl.gov/>.

Considered easy to use, there are several different POP servers that provide varying levels of features including local POP servers that may be established by LANL organizations with similar capabilities.

To use Eudora you must install the Eudora client software for your Mac or PC. It is available from ESD or can be purchased from the JIT vendor. The software must be configured to communicate to a selected POP server [see Table 5.1].

ICN POP accounts are available through the ICN Registry or by calling the CSC at 665-4444, extension 851.

POP servers use a special password (not your ICN password) that is defined at the time your account is established. It can be changed from within Eudora itself. For assistance call CIC-6 (665-4444). Eudora is the Laboratory's e-mail software standard for Macintosh and PC platforms as defined by IA.

CIC Supported POP Servers

CIC supports these POP servers:

BEASLEY	Extended service POP server
BUS-MAIL	BUS Division extended service POP server
CIC-MAIL	CIC Division extended service POP server
ESH-MAIL	ESH Division extended service POP server

NMT-MAIL	NMT Division extended service POP server
POBOX1663	Extended service POP server
X-MAIL	X Division extended service POP server

Using SSH to Encrypt Email

Secure Shell (SSH) can be used to encrypt your email password to protect it from 'sniffing'. SSH can also encrypt the transfer of email between the POP server and your machine, but note that the encryption does not apply beyond the POP server (e.g., when you send a message, then it will be sent unencrypted from the POP server to the other user). For details on how to configure Eudora to run through SSH, see the Information Architecture SSH/Kerberos section on frequently asked questions (FAQ). The FAQ is at <http://www.lanl.gov/projects/ia/stds/lanl/ssh-faq.html>.

Vacation Message for E-mail

Like voice mail, you can "display" an automatic reply vacation message to incoming mail senders. The vacation message will inform senders of your out-of-town dates. Call CIC-6 (665-4444, ext. 851) or send e-mail to cichelp@lanl.gov for assistance with the setup and activation of a generic or custom message on your behalf. The vacation e-mail will be sent to anyone that sends you e-mail. No replies are sent to distribution lists (e.g., cic-all@lanl.gov). For help, see C6help.lanl.gov.

Using Pine on a POP Server

When you don't have access to a workstation that has Eudora, or you can't make an appropriate network connection (PPP), you can still read your mail if you can connect via telnet, k5rlogin, or SSH to the POP server.

Log in to the server using your ICN Log-on/User number and ICN Password/Passcode. At the machine prompt (a % sign) enter the following command to identify the type of emulator you are using (typically a vt220):

```
setenv TERM vt220
```

Next, enter the command "pine." You will be presented with a series of menus that will permit you to access virtually all of the mail functions.

Registering Your E-mail Address

If your e-mail account is on a central Lab e-mail server, your e-mail address was

registered automatically at the time the account was set up. If your e-mail account is on another e-mail server (e.g., your group or division e-mail server), you must register your e-mail address yourself using the ICN Registry, or call Customer Support Center at 5-4444, ext. 851.

Registering your e-mail address has advantages. First, it allows you to create an e-mail address in the form "user@lanl.gov." This allows people to send e-mail to you (@lanl.gov) without having to know specifically where you receive mail (the name of the e-mail server). For example, mail sent to fred@lanl.gov may actually be delivered to flintstone_frederick@bedrock.lanl.gov.

If your actual e-mail address changes, you need change only the forwarding address—there is no need to notify others of such changes. Second, it allows people to use the Web Phone Book, Finger, or Ph utilities to find your e-mail address.

To register your e-mail address follow the instructions below. For help call Customer Support Center at 5-4444, ext. 851.

1. Go to the ICN Registry (<http://register.lanl.gov>).
2. Choose the e-mail option.
3. At the e-mail menu, choose "Create new lanl.gov address" and follow the instructions.

Table 5.1. How to Configure Eudora*

PC Eudora 4.x

1. Select "tools" and "Options" from the menu bar.
2. From the "Getting Started" category,
 - Enter your POP account: (e.g., u012345@cic-mail.lanl.gov)
 - Enter your real name: (e.g., John Doe)
 - Enter your return address: (e.g., Doe_John@lanl.gov)
3. From the "Hosts" category,
 - Enter POP account
 - Leave SMTP blank
 - Enter phone: ph.lanl.gov
 - Enter finger: finger.lanl.gov
4. From the "Checking Mail" category, check for mail every 10 minutes.
5. From the "Attachments" category, specify a directory location by mouse-clicking on the shadowed bar. (e.g., c:\eudora\attach)
6. Click "OK" to save from the Options window.
7. Quit and restart Eudora for changes to correctly take effect.

Mac Eudora 4.x

1. Select "Special" from the menu bar.
2. Select "Settings" from the menu.
3. From the "Getting Started" category,
 - Enter your name: (e.g., John Doe)
 - Enter your user/login name (e.g., u012345)
 - Enter mailhost (e.g., pobox 1663.lanl.gov)
 - Enter return address (e.g., john@lanl.gov)
4. From the "host" category,
 - Enter mail: pobox 1663.lanl.gov
 - Leave SMTP blank
 - Enter directory services: ph.lanl.gov
 - Enter finger: finger.lanl.gov

* Call CSC at 5-4444, ext. 851, for help with Eudora configuration.

Selecting an E-mail Name

An e-mail name can be something like abc, jsmith, or esalazar, or a maximum of eight characters. The e-mail name must be unique. (See p. 4-2.)

Forwarding Addresses

The forwarding address is where mail, sent to your_address@lanl.gov, will be delivered by the central LANL mail server. It will generally look like

username@machine.lanl.gov
such as

- u012345@pobox1663.lanl.gov
(a typical POP server mail address)

When Albert Casey registers abc as his e-mail name and u012345@pobox1663.lanl.gov as his forwarding address, he creates an e-mail address of abc@lanl.gov, which forwards mail to his account on pobox1663.

The ICN Registry can also be used to shorten or simplify an e-mail address. For help, call CSC at 665-4444, extension 851.

Secondary Names and Lists

You may register other names and distribution lists on the ICN Registry.

Secondary names are other e-mail names by which you may receive e-mail.

How to Change Personal Information

The personal information that appears in the ICN Registry and the Lab phone book is taken from the EIS database. Changes to this data can be made only through the EIS. Individuals requiring changes in their personal information should contact the person designated by the group leader as responsible for the group's EIS entries (usually your group secretary).

Finding E-mail Addresses

When attempting to send mail, you may not know the e-mail address of the intended recipient. To find basic information about a user, you can use one of the following tools: Finger on UNIX, Ph and Finger on Eudora, the LANL Phone Book via Netscape, lightweight directory access protocol (LDAP) via Netscape, and Directory Services in Eudora.

Using Finger

If you have access to the Finger command on your UNIX system, you can use it to access the phone book to search local and most remote sites for users who satisfy a variety of criteria.

This finger command lists all records that begin with "casey," including people with "casey" as first name, last name, or any name that starts with these letters. Note that two of those on the example below do not have registered e-mail addresses.

% finger casey@lanl.gov

012345 Casey Albert B. CIC-6 B251
505-667-7298 abc@lanl.gov

080330 Casey Hugh MST-6 G770
505-665-4719 hcasey@lanl.gov

113162 Casey Nancy N. CIC-3 B265
505-667-7028

114413 Olson Casey D. BUS-1 C121
505-667-1212

More information is available from the "long listing"

(UNIX "-l option") as shown below.

- % finger -l casey@lanl.gov
- name: B. Albert Casey
- znumber: 012345
- e-mail: abc@lanl.gov
- forwarding addr: u012345@cic-mail.lanl.gov
- phone:505-667-1234

- fax:505-667-6333
- organization: CIC-23
- postal address: MS B294
- location: TA-03 Bldg 0132 Room 534

To qualify the search, you can use the first name and encase the string in quotes.

finger "jose martinez"@lanl.gov

Additional information is available by entering finger help@lanl.gov.

Using the Eudora PH/Finger Client

Some systems, like the Eudora mail package, contain a Ph program that has a "point and click" interface. Note that instead of returning a single line of information, the Ph or look-up program always gives you the long listing of information for each person, and the Finger program provides a short list of information. To configure Eudora for this service, call CSC at 5-4444, ext. 851.

Using Web Phone Book

The Web Phone Book application is available from the LANL Home Page. Two options are available, a short query form and a more comprehensive query form.

Distribution Lists

Two applications are available to establish e-mail distribution lists. For more information about these applications, call the CSC at 665-4444, extension 851.

- Listmanager—permits you to create and maintain your own distribution list on the Lab mail host. These lists can be "public," which means anyone on the Internet can mail to them, or closed, in which case the list owner controls access.
- JIT-list—permits you to distribute e-mail based on demographic characteristics found in the EIS database. For example, users could send E-mail to all the people in a particular Laboratory building or group.

Hard Copy Output—Print and Graphics Express Station (PAGES)

PAGES provides a variety of printing services available through electronic access via the ICN. You can order any PAGES print service without leaving your office if you have a computer connected to the ICN and the proper PAGES access tools. These tools are available for Macs and PCs as well as UNIX machines.

In most cases PAGES can complete your print job the same day or even within hours. Print jobs can be delivered to your mail stop or distributed to on-site locations per your instructions. Your documents are available for pickup in TA-3, in the concourse of the CCF, Building 132. With PAGES you can print to a variety of media including the following:

- 36" color plotter,
- 8.5" x 11" black and white paper,
- 8.5" x 11" color paper or transparency,
- 8.5" x 11" color photo or transparency.

For more information see: <http://pages-sv/PAGES.html>

UNIX/VMS Output—PPAGES

The command "PPAGES" sends a variety of file formats such as ASCII text or PostScript to the PAGES output facility for printing on various media. PPAGES uses the command "LPR" (line print request) to transfer print jobs to PAGES. Most of the LPR, "LPQ" (line-printer queue), and "LPRM" (line printer/remove files) features are available, but they apply only to print jobs being transferred to PAGES. After a job is sent to PAGES, you may call the PAGES operator for its status (7-2905).

The PPAGES command requires the specification of the file type and format (see example below). Numerous other options are available (see the "man" page).

```
ppages -ft value -format fmt filename
```

If you do not list any options, PPAGES will assign default values for the format you entered.

PPAGES uses the Kerberos authentication process to validate your print request. You must use the "kinit" command before attempting to send output to PAGES.

PPAGES needs your Z-number and ICN charge code before the job can proceed. It passes the values of the "environment variables" called "ICNZ" and "ICNCHARGE" to PAGES for accounting and to look up the user's delivery destination. Thus, you must have a valid charge code established.

Macintosh Output—PAGES

If you are a Macintosh user, there are two ways to print to PAGES. You can use PPAGES for Macintosh (the "normal" way). PPAGES for Macintosh creates and ships files to PAGES in a single-step process. This is generally preferable; however, you must have AppleTalk capabilities to use PAGES with the "native" Macintosh operating system.

To determine if you have a direct AppleTalk connection to PAGES, open the chooser and verify the AppleTalk zone list for a zone entitled "PAGES." If the "PAGES" zone appears, you have a direct AppleTalk connection to PAGES services. Otherwise your Mac is not connected to a network, or AppleTalk is not routed from your network to PAGES. Contact your local system administrator, who may be able to install the PAGES zone.

Assuming you have network access, you must install LaserWriter 8 (you probably already have it) and a set of PostScript printer description (PPD) files for the PAGES devices. These are available on-line in the form of an installer program.

Microsoft Windows Output—PPAGES

For Microsoft Windows, the best methods for accessing PAGES services are listed below in descending order.

- Use the Adobe PPD, version 2.1 or later. Like the native Macintosh operating system graphical user interface (GUI), this driver can create and ship files in a one-step process. For detailed instructions on downloading and installing, refer to the documentation in HTML or PDF 1.1MB format.
- Use PPAGES for DOS.
- Use LPR for DOS.

The second and third methods are command-line interfaces.

MS Windows Requirements

To use PAGES from your Windows PC, your PC must be on the unclassified network. You will need to install Adobe's PostScript printer driver for Windows and set up the PAGES devices as network printers. An archive file is available on-line.

Novajet III Printing

This plotter is also capable of producing A- through E-sized color drawings on roll-fed material with a new 60-in.-wide service to added soon. The advantage of Novajet is that it provides extremely high-quality output using state-of-the-art ink jet technology.

PAGES Job Status Reporting

A Web interface is available for querying the status of jobs sent to PAGES. This service allows you to see what jobs you have in the queue, when they were printed, what options were requested, etc. You can query by Z-number, job number, or PAGES queue name. This service can now be accessed on the Web at http://pages-sv/pages_status.html.

Transferring and Storing Files

Several methods are available to transfer files between computers and file storage. This section will briefly describe the following:

- FTP—Transfer files between Internet hosts,
- HPSS—Store files from high performance computers,
- CFS—Transfer files to permanent storage,
- NFS and DFS—Share files between hosts, and
- ADSM—Back up files to a central server.

Encrypted FTP

FTP connections can be encrypted through either Kerberos or SSH to protect passwords from “sniffing.” For details, see the IA SSH/Kerberos FAQ.

URL: <http://www.lanl.gov/projects/ia/stds/lanl/ssh-faq.html>

File Transport Protocol (FTP)

The FTP facility copies files between IP hosts and offers many options including the ability to delete files, list directories, and change directories on the remote machine. To retrieve a specific file you need the following:

- The name of the remote host (computer),
- An account on that computer (user ID and password), and
- The path name to the file.

The general form of the UNIX command is `ftp remote_hostname`

PCs may use the FTP while Macs will use Fetch. When the connection is ready to accept FTP commands, the prompt “ftp>” appears.

Anonymous FTP

Anonymous FTP allows limited access rights to information by users who do not have regular accounts on the remote host by using a special account called “anonymous.” The only operations allowed are logging-on using FTP, listing the contents

of a limited set of directories, and retrieving files. Anonymous users are not usually allowed to transfer files to the remote site.

Anonymous accounts typically use “anonymous” as the log-on name and the password “guest” or your e-mail address (if it is requested by the log-on prompt).

High Performance Storage Systems (HPSS)

HPSS provides a scalable parallel storage system for highly parallel computers (such as the Origin 2000) as well as traditional supercomputers (UNICOS) and workstation clusters (ONCS—unclassified network computer cluster). HPSS requirements are driven by high-performance computing environments, such as the National Information Infrastructure (NII), in which large amounts of data are generated by massively parallel processors (MPPs) and workstation clusters. Scalability is in several dimensions: data transfer rate, storage size, number of name space objects, size of objects, and geographical distribution. Although developed to scale for order of magnitude improvements, HPSS is a general-purpose storage system.

HPSS may be of interest in situations having present or future scalability requirements that are very demanding in terms of total storage capacity, file sizes, data rates, number of objects stored, and number of users. HPSS is part of an unclassified, distributed environment based on The Unclassified Group's Distributed Computing Environment (DCE) products that form the infrastructure of HPSS.

The parallel storage interface (PSI) is used for accessing the HPSS. The PSI is modeled largely after UNIX file system commands. Using PSI commands, files may be transferred between a client (i.e., a worker machine, or a workstation) and HPSS, and the attributes of files can be displayed and/or modified.

Using the Common File System (CFS)

The CFS is used to store files on a permanent basis. CFS is available from all computing partitions. The following utilities allow you to work with CFS from UNICOS or other UNIX workstations:

- The CFS command utility,
- An FTP client, and
- The Kerberos commands `kcp` and `ksh` (or `k5rsh`).

Note that CFS is currently being phased out in favor of HPSS, NFS, and DFS.

The CFS Command Utility

The CFS command utility is available on all ICN production platforms. It is distributed with the Kerberos software, which can be downloaded from ESD, and is available for most UNIX workstation platforms. UNIX workstations must have the kerberos software installed to use the CFS command utility. To use the CFS command utility from a UNIX workstation, you must first get a Kerberos ticket. The CFS command utility can be run as a “one-line” command (i.e., “`cfs list`”). The CFS command utility can also be run interactively by simply entering the command “`cfs`.” The CFS command utility supports a wide variety of subcommands and options. Table 5.2. is a summary of the more commonly used commands. Note that before saving any files on CFS, you must create a root directory.

FTP Client

Normal FTP clients that come with most UNIX workstations and with all production ICN machines can be used to access the CFS. FTP clients that run on personal computers (both Macintosh and Windows) can also be used to access the CFS. The host name to “FTP” to is `cfs.lanl.gov`. The login is the basis of authentication, and no further authentication is required. If your host operating system supports the

Kerberos version of ftp (kftp), then CFS will use the Kerberos credentials supplied to it and not prompt for your user number or ICN password.

From a UNIX platform, enter the following: "ftp cfs," your log-on moniker (Z-number, Z-number prefaced with a U, user's initials, first name, last name, or combination thereof, depending on the system), and your ICN password when prompted. You will normally be put directly into your default CFS directory (usually /Z#, i.e., /123456). Then you can use "cd" to change directories to whatever directory you wish and use normal FTP commands ("get," "put," etc.) to perform the desired FTP function.

Graphical FTP clients, such as Fetch (Macintosh) can be used to connect via FTP to the CFS. Point the client to the CFS with your moniker and ICN password. As

when you use the standard FTP, you will be placed into your default directory. There is one major difference with these types of graphical clients when accessing CFS versus accessing standard FTP sites: to reference a topic-level directory tree other than your default CFS directory tree, you cannot use the normal GUI point-and-click means. Most graphical FTP clients have a menu option that allows them to change directories; at that option you can type the path to the desired directory.

If that does not work, look for an option that will allow you to issue a typed FTP command. There you enter the command "d=/path" where /path is the full path to the directory (or to the parent directory so that the graphical nature of the ftp client can take over). Many graphical FTP clients (e.g., Fetch 3.0+ and Anarchie) remember all of the directories that you

have visited at a particular FTP site, so you can still "point and click" your way around the CFS.

Kerberos Commands

With the implementation of Kerberos Version 5 throughout the ICN, secure authentication of users is now possible with standard UNIX-type utilities. The CFS gateways have been modified to accept Kerberos credentials in lieu of the ICN user number and password. Two commands have been made available, "k5cp" and "k5rsh." The kcp command is used like a standard UNIX "rsh" would be used:

```
k5init tds
```

```
kcp cfs:/cfs/roots roots
```

Table 5.2. Basic CFS Commands

Function	Typical Command
Create root directory with user number as name	cfs create
Create named root directory	cfs create/ named root
Overwrite a CFS file	cfs replace filename
Save a new file or overwrite an existing file	cfs store filename
Save a new file to another root	cfs save/named root/file
Retrieve files	cfs get filename
Delete files for CFS	cfs delete filename
Turn off delayed delete (24 hours)	cfs delete delay =off filename
Recover deleted files marked as "dying"	cfs rescue filename
List CFS files and subdirectories	cfs list

Additionally, CFS requests that do not result in a file transport (i.e., get, save, replace, and store) can be issued through the command ksh:

```
K5init tds
```

```
K5rsh cfs add /081441/temp
```

Where UNIX pipes can be used, they can also be used to and from CFS.

Network File Service (NFS)

The NFS servers offer a storage capability for workstations, desktop computers, supercomputers, and all other computing platforms around the Laboratory. The NFS servers provide a remote UNIX "file system" that looks and acts like a local file system. Projects large and small can utilize this service to provide centrally located files that are available to remotely located desktop computers, workstations, and ICN compute servers (i.e., Crays, Cluster, and Connection Machines).

Employing NFS can reduce disk purchases and your project's file system administration and set-up problems involving file sharing across multiple computing architectures.

The NFS service includes the following features:

- Daily backups of your data to ADSM in the unclassified or secure environments,
- 24-hour help via pager 104-8290 (to an NFS system administrator) 7 days a week,
- Access for your questions, problems, or suggestions through e-mail (nfs@lanl.gov),
- Economy (\$20 per gigabyte per month—with unlimited access),
- Server access via fast fiber-optic connections to the LANL "backbone,"
- Server power connected to an uninterrupted power supply,

- Server location in a secured and controlled-area access computer room (CCF), and
- Files up to 2 gigabytes.

Adstar Distributed Storage Manager (ADSM)

ADSM is a client/server software product that provides full and selective backup and archival services for client machines such as PCs, Macs, many UNIX-type machines, and NFS file servers. ADSM can back up the client machine automatically according to a schedule requested by the user, or the client can be backed up manually by the user at any time. Initially, ADSM does a full backup of a workstation; thereafter, it copies only those files that have changed since the last backup. A "restore" of a backup at the "file" level can be done at any time, and all file attributes (permissions, etc.) are restored.

To use ADSM, you must first register your workstation with the ADSM server on the Web. To complete registration, you must have your machine's network node name, your cost code and program code, and your Z-number. You will also be asked to set your own ADSM password for access, to choose one of four automatic backup schedules (6 p.m. to 6 a.m. is the default), to choose when or if you want to be notified that an automatic backup has failed, and to choose who (if not you) should be notified if it has failed. You can also register by e-mail if you provide the necessary information to adsm_help@lanl.gov. To register or get help, see the ADSM Web site at <http://storage.lanl.gov>.

There is a one-time registration fee to pay for the software license from IBM; a monthly service charge, which covers unlimited backups; and a monthly storage fee.

Distributed File System (DFS)

DFS, available in the unclassified and secure partitions, is the key information/data sharing service in a distributed computing environment (DCE). DFS provides a single virtual file system with a single name space across multiple hardware architectures and geographically dispersed DCE cells. It provides a consistent interface for users accessing data in DCE.

Since DCE and DFS provide the security required for sharing data across geographically dispersed domains, DFS has been chosen as the distributed data sharing mechanism for the tri-lab ASCII program. (See p. 8-2.)

Mercury File Transfer Service

The Mercury service provides a command-line interface to copy unclassified CFS files between the unclassified and secure ICN networks.

Before you can push and pull files across networks, you must set up a CFS directory on both the unclassified and secure networks to allow Mercury user number 900544 to read-from and write-to at the time of transfer. We recommend that you create separate directories for file transfers to differentiate files for transfers from those that exist strictly for storage. Once the directories are created, they can be removed and kept for future transfers.

Run CFS interactively from your workstation or from a Cray worker machine. If you are on your workstation, you will need to get a Kerberos ticket with "k5init" to run CFS.

You must get a Kerberos ticket with kinit to run Mercury commands whether you are on a workstation or on a Cray worker machine. The Mercury system depends on Version 5 Kerberos (k5rsh). You can run Mercury only from machines that can execute kinit, which is available on UNIX-based machines including Crays.

Check the Mercury "man page" for detailed usage descriptions and examples of how to transfer CFS files using the Mercury commands "push," "pull," "status," and "mcancel." The Mercury man page is available in /usr/lanl/man in both the unclassified and secure networks (/usr/local/man on the Crays).

Using HPSS

HPSS is used for archival storage of files and is available in both the unclassified and secure partitions. As of this writing, HPSS is currently in transition from being a system with limited availability in user-friendly status to a widely deployed production-quality storage system. For archival storage, HPSS is expected to eventually replace CFS.

To determine whether HPSS is currently available on your system, visit the HPSS web site at <http://storage.lanl.gov/cic11/hpss.html>. Information on how to obtain an HPSS account and to get the HPSS client and user interface software is also there. Authentication and authorization information is also available. The PSI is the recommended application for access to HPSS. The PSI man pages are located at the HPSS web site.

PSI is modeled largely after UNIX file system commands. Using PSI commands, files may be transferred between a client (i.e., a worker machine or a workstation) and HPSS, and the attributes of files can be displayed and/or modified.

Commands may be entered on the PSI command line, for example:

```
% psi get MyFile
```

If PSI is started without a command on its command line, it will read commands from standard input (prompting if standard input is the keyboard) until a "quit" or a "control-D" is entered, for example:

```
% psi
```

```
PSI>get MyFile
```

The World Wide Web (WWW)

The WWW enables anyone to locate on-line information that pertains to his/her particular field of study. The web provides a suite of functions including the following:

- text retrieval,
- e-mail,
- keyword searches,
- FTP file retrieval,
- access to Telnet-based servers,
- retrieval and display of graphic files, and
- audio files and media broadcasts.

Responsible Web Use

At Los Alamos National Laboratory, we recognize and value the Internet as a diverse, decentralized, and robust mechanism for publication, communication, and research. We support the responsible use of the Internet and encourage the Laboratory community to make use of modern communications tools such as e-mail and the WWW. As a national laboratory, we have unique obligations to protect the property and interests of the United States government. To promote these goals, we adopt the following guidelines for responsible use:

1. Promote the sharing of information.
2. Protect sensitive and classified information.
3. Use the Internet for official purposes.
4. Demonstrate professional, ethical, and courteous use.

See the IA standard at this Web site: <http://www.lanl.gov/projects/ia/stds/ia550712.html>.

Getting Set Up to Use the Web

The web can be accessed from browsers such as Netscape 4.0. To access the web you need the following:

- A workstation such as Macintosh, PC, or UNIX platform,
- A physical connection to the Los Alamos network,
- A web "browser." (Netscape is the Laboratory IA standard. See the ESD Web site to order Netscape).

Access the web by entering the browser command "NETSCAPE" (UNIX) or click on the related icon (Mac or PC). Although many functions are intuitive, there is a button on the browser labeled "HELP," which will lead you to additional information on using the Web.

The "home page" is the beginning point for entry into a primary Web information environment. To go directly to a Web site or home page, you can use its universal resource locator (URL) or path. There are several types of URLs, but the form that selects a Web site for browsing is similar to <http://www.lanl.gov>. To enter a URL, you may either select "File" from the main menu on the web browser and, from the menu displayed, click on "Unclassified Location," or click on the unclassified button on the tool bar. This will open a small window into which you will type the desired URL.

If you have set your browser to default to the LANL home page, then clicking on "home" will take you to the Laboratory home page. From this home page you can click on any underlined or highlighted topic to move you through the Laboratory Web pages and link to the information contained there. For help call CSC at 5-4444, ext. 851. To establish LANL as your home page, follow these steps using Netscape 4.04:

1. From the very top tool bar, pull down the "Edit" menu,
2. Select "Preferences,"
3. Click on the "Navigator" tab,
4. Click in the "Home Page Location" box,
5. Type <http://www.lanl.gov>, and
6. Click the "OK" button.

If a web reference returns the error "Unable to find Application," or the wrong action occurs, you may need to configure your browser to point to a helper application. To accomplish this, follow the steps below using Netscape:

- From the very top tool bar, pull down the "Edit" menu,
- Select "Preferences,"
- Click on the "Navigator" tab,
- Highlight "Applications."
- Numerous helper applications exist such as Telnet, Acrobat Reader, RealViewer, etc. Click on the help button to obtain more information about configuring the browser for your specific needs.

Network Information Resources

There are a wide variety of information resources available from the ICN and its connection into the Internet. This section will preview some web pages.

Research Library Home Page

The Research Library's home page provides a link to general information about the Research Library including its collections, services, and publications, as well as links to other resources. Some of these resources are the Library's On-line Catalog, which is used for locating books and journal titles in the collection; subject resources for locating Internet information on physics, chemistry, biology/genetics, business, etc.; and Los Alamos publications including LA reports, *Dateline Los Alamos*, *LA Science*, and *Research Highlights*.

Major effort has gone into the Subject Resources page. Librarians in the Research Library have responsibility for selecting appropriate Internet resources (such as the "Table of the Nuclides" and "Standard Atmosphere Computation") in their assigned subject areas.

Library Without Walls (LWW) Project

Several efforts within the LWW project are currently in progress. First is the on-line electronic document effort, which has a goal of capturing and displaying all Los Alamos report files in electronic form. The viewer for these report files is Adobe Acrobat, which created files in PDF. Adobe Acrobat will run cross-platform on IBM DOS or Windows, Macintosh, and Sun SPARC UNIX. (Acrobat is available free from CIC-2, 7-4357.)

Web Access to SciSearch and BIOSIS Databases

The Research Library's database SciSearch is based upon the Science Citation Index SciSearch Database, an international multidisciplinary index to science and technology literature maintained by the Institute for Scientific Information. The Research Library also offers access to BIOSIS, a citation index for biological sciences, and INSPEC, a database for physics, electrical engineering, electronic engineering, and computer literature.

Network News Facilities

ClariNews is an electronic newspaper containing professional news and information delivered to your computer in the "usenet" news format and is updated continuously all day long. You can receive ClariNews through a standard news reader if your system is so configured.

USENET news is available from machine newshost.lanl.gov. You can access the news via several client news reader programs. Your workstation must be on a LANL network to read news from newshost.lanl.gov.



Section 6: Enterprise Information Applications (EIA)

Enterprise Information Applications (EIA) provide access to a wide variety of administrative information and resources. The applications have been designed to serve a wide range of users including clerical, technical, management, and professional staff.

EIA does not include all the computer systems available at the Laboratory. They are information systems used by people "Labwide" as opposed to information systems used for special interest groups or computer systems used for scientific computing. Some of the applications, such as Time and Effort, Travel, and Employee Information, may be used by all employees. Other applications (e.g., Clearance) are specialized and require specific authorities for access. The applications you use will depend on the tasks you perform on your job.

EIA Descriptions

Table 6.1. is an alphabetized listing of all EIA. Each entry contains the name of the system, a short description of the system's function, and the type of computing environment required to access the system. For more information see this Web site: <http://eia.lanl.gov/documentation.htm>.

Authorities

To view or update information in EIA, you need to have authorities unique to each system. Lab employees and most contract employees are given limited authority automatically to view their own data. If your job requires you to see group or division information, you need additional authorities. In most cases, line managers assign additional authorities to their employees. A user guide "Using IBM Systems" is available to help guide you

through establishing authorities. The user guide can be found at the following Web site <http://iosun.lanl.gov:2001/htmls/infoSys/icn/labwide/labwide.html>. For help with system authorities contact the EIA Consultants at 665-4444, option 2, or eiaconsult@lanl.gov.

EIA Editions

EIAs come in one or more editions: IA, IB, Web, and Enterprise Server. Each edition resides on a different machine, or platform, and requires a slightly different setup on your desktop computer. Depending on your job, you may need to use applications on one or all platforms.

To use any edition of any application, you must have the following:

- ICN access (see Table 2.4),
- system-specific authorities (see Table 2.5),
- a communications link (see Table 2.2), and
- specific networking software (see Table 2.3).

When you set up your computer to use the applications, you may want some help from either your system administrator or CIC-6 Desktop Consulting (5-4444, option 5). There are, nevertheless, some things you can do on your own. See this URL: <http://eia.lanl.gov/requirements.htm>



Table 6.1. Enterprise Information Applications Descriptions

Application Name	Description	Access
Affiliate Information System (AF)	View agreement, arrangement, and payment information on affiliates. HR-5, BUS-5, and managers only.	IA
Affirmative Action (AA)	Generate reports concerning the Laboratory's compliance with federal affirmative action policies.	IB
Automated Chemical Inventory System (ACIS)	Track chemicals and gases purchased for use at the Laboratory from receipt through disposal.	IB
Budget System (BUCS)	Query historic allocations.	IA
Clearance System	Track clearance data. Badge Office only.	Enterprise server
Data Warehouse	Generate reports from a wide variety of data (e.g., financial, facility, or recharge). Provides quick, ad hoc, and standard reports.	Enterprise server
Data Warehouse	Generate reports from a wide variety of data (e.g., financial, personnel, facility, or recharge). Provides quick reports.	Web
Electronic Authorization System (EAS)	Determine access to EIA.	IB
Employee Development System (EDS)	Track employees training, view course information, request enrollment in Lab-sponsored courses, and request transcripts.	Enterprise server
Employee Information System (EIS)	Update Laboratory directory information. View employee salary, history, and directory information (i.e., personal, location, and address information for Lab and non-Lab employees).	IB
Facilities Project Information/ Work Order (FPI)	Track work-order costs and multiple construction projects from inception to completion.	IB
Financial Management Information System (FMIS)	Track the financial status of organizations and programs. Includes costs, allocations, and outstanding commitments.	IB
Invoice Approval System (IAS)	Review and approve invoices for purchase orders.	Web
Just-in-Time (JIT)	Search for and order items from Laboratory vendors' catalogs.	Web
Laboratory Authors System (AUS)	Track Laboratory research documents. Contains unclassified bibliographic citations.	IA
Mail Channels (MC)	View source document numbers, names, and addresses of authorized recipients; document security levels; and view special instructions and restrictions about transforming documents to authorized external personnel.	IA
Property Accounting, Inventory, and Reporting System (PAIRS)	Manage and administer active, excess, and retired property.	IB

Table 6.1. Enterprise Information Applications Descriptions—cont.

Application Name	Description	Access
PassPort	Computerized Maintenance Management System (CMMS) is a system of integrated software applications that tracks work management products such as planning, scheduling, initiation, and progress.	Enterprise server
PAIRS (Accountability Statement and Data Warehouse Reports)	Review and update property accountability statements and obtain property reports. For all employees who have property assigned to them.	Web
Purchase Card System (PCS)	Reconcile, approve, and review monthly statements of accounts. Cardholders and approvers only.	Enterprise server
Purchasing, Accepting, Invoicing, and Disbursing System (PAID)	Pay vendors for goods and service. BUS only.	IB
Receiving/Procurement (RP2)	Track receipt of ordered goods. BUS only.	IA
Recharge System	View and update charge codes for CIC recharge services, including computing services, file servers, network services, and PAGES. For all users of CIC computing/network services.	Web
Resource Planning Module (RPM)	Plan and monitor budgets. Managers, business team leaders, and budget analysts only.	Enterprise server
Salary Review System (SRS)	Distribute funds for salary increases. Managers only.	IA
Secretarial/Contract Services (SE)	Request temporary secretaries and contract workers; report contract workers' time.	IB
Signature Authority System (SAS)	Assign authorities so employees can purchase materials, transport hazardous materials, etc.	IB
Stores	Search for and order items from Laboratory vendors' catalogs.	IA
Time and Effort (TE)	Enter and approve Laboratory employees' time and effort.	IB
Time and Effort	Enter and approve Laboratory employees' time and effort. Perform mass recoding.	Enterprise server
Training Questionnaire (TQ)	Fill out and approve questionnaire identifying required training for Laboratory personnel	Web
Training Validation	Take on-line courses and tests necessary for job certification. System updates successful students' EDS records.	Web
Travel System (TR)	Submit and approve travel expenses online.	Enterprise server

Note: For applications on the IB and IA machines, you must have the appropriate communications software and configuration. Client/server applications can be downloaded from ESD.

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Section 7: Computer Training

Classes are available for technical and advanced technical computer training. To register or get information regarding classes, go to the LANL home page and select Computing/Training. Table 7.1 lists some of the courses currently available. For additional help call the Training, Development, and Coordination team at 665-4444, option 4, or send e-mail to cic6-train@lanl.gov.

Designated Training Generalist (DTG)

Each Laboratory Division has at least one training generalist who oversees the day-to-day training activities of the organization. For example, the DTG develops training plans, documents employee qualification and certification training, formalizes the organization's training, and maintains training records and documentation.

If you have questions about required training in your Division, or you would like to view the training records of yourself or your employees, contact your Division's DTG. A list of DTGs can be found on the Web at <http://www.hr.lanl.gov/training/dtg.html>.

Table 7.1. Technical and Advanced Technical Computer Training Courses

Communications	Office Skills 2000	Web Authoring and Browsing	Coming Soon
<ul style="list-style-type: none"> •Eudora 4.x •Meeting Maker 5.0.3 	<ul style="list-style-type: none"> •Office Skills 2000—LANL Computing •Office Skills 2000—Professional Development 	<ul style="list-style-type: none"> • Dreamweaver 2.0—MAC or PC • FrontPage 98 • HTML Basics • HTML Intermediate 	<ul style="list-style-type: none"> • Directory Information System (DIS)—Web • Recharge • Procurement desktop
Enterprise Information Applications (EIA)	Other EIA Courses	System Administration Training	
<ul style="list-style-type: none"> •Date Warehouse—Basics •Date Warehouse—EDS Reports •EDS—Basics •EDS—GUI •EDS—Training Plans •Infomaker •Invoice Approval System •Purchase Card System •Time & Effort GUI •Travel Foreign GUI •Travel Domestic GUI •Web JIT 	<ul style="list-style-type: none"> •Financial Management Information System (FMIS) •Property Accounting, Inventory and Reporting System (PAIRS) •Signature Authority System (SAS) •Secretarial/Contract Service (SE) •Salary Review System (SRS) •Directory Information System (DIS) •Automated Chemical Information System 	<ul style="list-style-type: none"> • SGI System Administration (Beginning) • SGI System Administration (Advanced) • SGI Network Administration • SGI Performance Evaluation and System Tuning • Solaris 7 System Administration • Solaris 7 Network Administration • Solaris 7 Server Administration • Unix and Widows NT Integration • Windows NT Workstation and Server • Windows NT Optimization and Troubleshooting • Windows NT Security 	

Table 7.1. Technical and Advanced Technical Computer Training Courses—cont.

Programming Training	Application Training	ASCI
<ul style="list-style-type: none"> • C Programming (Beginning) • C Programming (Advanced) • C++ for Experience C Programmers • ANSI/ISO C++ Programming Clinic (Advanced C++) • Distributed Objects Using Corba • Java Programming • Java Program Workshop • Distributed Programming with Java • Object Technology—A Management Overview • Object-Oriented Analysis and Design • Perl Programming • Advanced Perl Programming with CGI • C-Shell Programming • Programming for Beginning using Java 	<ul style="list-style-type: none"> • Advanced WWW Development • FrameMaker Basic and Advanced • Foundations of IDL Programming • IDL 5.0 Graphic Object Workshop • Netscape Servers for Intranet Development • Origin 2000 Applications Programming and Optimization • Sendmail—Managing Internet Mail • C++ and the Unified Modeling Language • Sybase Fast Track to Adaptive Server Enterprise 11.5 (ASE) • Sybase Performance and Tuning for System 11 • Sybase SQL Server Administration • Unix (Beginning) • Unix (Advanced) • Visual Basic 5.0 Fundamentals • Visual C++ Windows Programming 	<ul style="list-style-type: none"> • Mastering Projects Workshop • Software Engineering for Scientists and Engineers • Getting started on ASCI Blue Mountain Systems • Running MPI on Blue Mountain Systems • Introduction to Totalview • LSF (Load Sharing Facility) • Introduction to HPSS (High Performance Storage System)

** You do not need an ICN password to use e-mail.



Section 8: Scientific Computing

Accelerated Strategic Computing Initiative (ASCI)

The US commitment to end underground nuclear testing and constraints on non-nuclear testing calls for new means of verifying the safety, reliability, and performance of the US nuclear stockpile. While new weapon production has ceased, the ability to design nuclear weapons, analyze their performance, predict their safety and reliability, and certify their functionality as they age is essential for conscientious management of the enduring stockpile.

Dramatic advances in computer technology have made virtual testing and prototyping viable alternatives to traditional test-based methods for stockpile stewardship. Rudimentary versions of virtual testing and prototyping exist today. However, to meet the needs of stockpile stewardship in the year 2010, applications must achieve higher-resolution, three-dimensional, full-physics, and full-system capabilities. This level of simulation requires high-performance computing far beyond our current level of performance.

ASCI is a tri-laboratory and Defense Programs collaboration, in concert with IBM, Intel and Silicon Graphics (SGI), to create virtual testing and prototyping capabilities based on advanced weapon codes and high-performance computing. A powerful problem-solving environment is being established to support application development and enable efficient and productive use of the new computing systems. The LANL ASCI/SGI effort is referred to as ASCI Bluemountain, Sandia/Intel is ASCI Red, and Livermore/IBM is ASCI BluePacific. This capability is being made available for other scientific endeavors in an unclassified environment using the Origin 2000 compute servers.

Getting Started with ASCI

Because ASCI is a rapidly changing environment, most documentation is located online. New users to LANL's Origin 2000s often have questions about special log on procedures, LSF job scheduling, MPI programming, and the use of modules. New users should look at the following Web sites located in both the unclassified and secure networks:

LANL ASCI Homepage: <http://www.lanl.gov/asci/bluemtn/bluemtn.html>

This page gives you the needed links to get application forms, latest information about the ASCI machines, and other vital information.

LANL ASCI Annotated Examples Guide: <http://www.lanl.gov/asci/bluemtn/examples/>

This guide takes the new user step-by-step into the LANL ASCI world. Up to date examples are maintained that show the user everything from how to log on to the machines to running a parallel code across several machines with MPI. It is a good idea to look here first if you intend to run on ASCI

ASCI Today: <http://www.lanl.gov/ascitoday>

ASCI Today shows the user the current configurations of the ASCI environments. Announcements and schedules for the machines are posted here. Because the Web page often changes every hour, active users browse this page several times a day.

Compute Servers

This section will help you choose the operating system and computer combination that are best suited to your computing

needs by presenting a brief description for each operating system. Each description includes pertinent access information for each operating system, its typical uses, limitations, and characteristics.

The optimum system for a given computer application will vary with the characteristics of the code. The use of floating-point operations, the percentage of vectorized code, and the average vector length for the codes are some of these characteristics. Use the Register facility to obtain an account on the ICN compute servers described in this section.

Using the Register Facility

Follow these steps to obtain an account on the compute servers:

- Log in to the Register facility.
- Select Option 1 "Go to name registration."
- From the subsequent menu select Option 2 "Register for ICN Computing Resources."

A complete list of compute servers is found on the Web at <http://icnn.lanl.gov/icnn>.

SGI Origin 2000

As a part of the ASCI project, Los Alamos has established a complex of Silicon Graphics, Inc. (SGI) Origin 2000 clusters in both the unclassified and secure computing environment. The compute servers in each cluster include up to 128 CPUs, plus individual memory and scratch disk space. The Origin 2000 architecture consists of shared memory machines with incremental parallelization. The machines can also use "traditional" distributed memory message-passing (i.e., MPI—message passing interface). This approach is based on providing the

requisite computational resources through multiple clusters of shared-memory multiprocessor systems (SMPs) that have five components:

- hierarchical system of memories and latencies;
- multiple high-performance distributed systems;
- shared memory over a significant and economical computational resource;
- high-performance memory access; and
- multiprocessor, i.e., supporting a shared-memory environment across multiple processors.

Cellular IRIX is the operating system in use. It is UNIX System V and is POSIX compliant.

There are four separate clusters available. The primary ASCI system is a 48-machine cluster, 128 processors per box, labeled as b01, b02, etc, and accessed through front-end machines "bluemountain.lanl.gov" and "mountainblue.lanl.gov." This is the cluster that set the speed record in November 1998 using the LINPACK benchmark. The machine is shared across several special projects and supports development. A separate 64-processor machine—k01, front-end "kappa"—is available in the secure/classified environment for general production work.

In the unclassified environment, a 16-machine cluster, 128 processors per box, is collectively known as "Nirvana" and the individual machines are labeled n01, n02, etc. A second unclassified cluster is available for production work—t01 and t02, both 32-processor machines, front-end "theta". Machine t01 is used for interactive work, and t02 is reserved for batch submissions. The Nirvana and Theta systems are completely separate; jobs intended for Nirvana nodes may only be submitted from Nirvana nodes, and likewise for Theta jobs.

Eligibility

At this time, access to the Origin 2000 computing resources is limited to those users who are involved with the following programs and/or projects:

- ASCI
- DOE Computer Hardware, Advanced Mathematics, and Model Physics (CHAMMP),
- DOE Grand Challenges,
- ACL/LANL sponsored projects such as Crisis Forecasting, Laboratory Testbed, Defense Threat Reduction Agency, Laboratory Directed Research and Development, Nuclear Weapons Technology Programs.

Prerequisites

An active Los Alamos ICN account is a prerequisite for obtaining an account. This requires the following:

- an ICN unclassified password has been established,
- a primary name has been established (use the ICN Registry),
- the forwarding e-mail address has been set (use the ICN Registry),
- registration for ICN computing resources [Advanced Computing Laboratory (ACL) access] has been requested (use the ICN Registry).

Users of the ACL machines need to make sure that the Unclassified Blue Mountain Account Application form has been completely filled out and submitted. Users of the Theta Cluster need to request a theta account by using the ICN Registry.

Load Sharing Facility (LSF)

LSF is the load sharing and distributed batch-queuing software system that integrates the Origin 2000 network of computers. Jobs are submitted to the ASCI Bluemountain cluster through queues that provide access to various machine groups, user groups, or resources.

Distributed Computing Environment (DCE)

DCE consists of a set of integrated tools, protocols, and methods that enable interoperability in heterogeneous, networked environments. In an ideal distributed computing environment, different types of computers, operating systems, and networks should interact as if they were all part of a single system. DCE is a set of services that can help achieve this goal—to deliver information from wherever it is stored to wherever it is needed without exposing the network's complexity to participants.

Sometimes DCE is referred to as middleware or enabling technology. Its services form a layer between applications that have been developed for distributed environments and the diverse computers, operating systems, and networks that make up a complex computing environment.

The Distributed File System (DFS)

DFS is the key information-sharing component of DCE. DFS joins the file systems of individual workstations into a single virtual file system with a single name space, and it provides a consistent interface for users anywhere in the environment.

Visualization Software

Origin 2000 visualization utilities include the following:

- IBM Data Explorer (DX) general-purpose software package for data
- visualization and analysis.
- CEI EnSight Software package for visualization of results data.
- OpenGL, a high-performance 3-D-oriented renderer.

Cray UNICOS

UNICOS is used primarily for scientific computing with emphasis on large programs that require extensive calculations and significant internal storage. UNICOS supports a software-rich environment for many traditional computing applications. Large memory allocations per user on UNICOS permit effective and efficient computing of large problems. You can perform multiple computing tasks (with some limitations) by moving processes to the background. Documentation in support of UNICOS can be obtained by calling Cray Research, Inc. at (612) 683-5907.

The UNICOS operating system provides a UNIX-based System V environment, which conforms to the POSIX 1003.1 standard. This includes Berkeley Software Design, Inc. (BSD) extensions to the System V and sessions (similar to BSD job support), symbolic links, long file names, and signal support. Many performance tools are available with an X Windows System interface that makes hardware performance features much more accessible. The output of these tools can be shown and manipulated graphically, which allows you to interpret performance parameter relationships easily and optimize their codes.

UNICOS itself does not provide for magnetic tape input or output. You may read and write magnetic tapes through the IES (an extension of CFS), where they would be accessible from UNICOS.

A locally developed CPU scheduling algorithm, known as opportunity scheduling is installed on all UNICOS systems. The objective of "opportunity scheduling" is to give users direct control over their available CPU time. By adjusting user-adjustable priorities and relative shares, a user organization can ensure that its most important work is always completed, irrespective of the total load on the machine. (UNICOS previously used a process called the "fair share scheduler" to allocate resources).

Computing costs are calculated by charging for the use of specific UNICOS resources based on whether the computing is interactive or batch-type as submitted through the production- or batch-workload manager.

Graphics Facilities

Virtual Reality (VR)

VR is a form of computer graphics that gives the user the perception of being immersed in a synthetic space. VR is done through the following techniques:

- One or more computer-graphics-rendering engines for generating viewable surfaces,
- Head-mounted display for viewing the virtual world while masking out the real world or, alternatively,
- 3-D liquid crystal glasses for viewing stereoscopic images projected onto a screen,
- Data gloves and body suits for detecting positions and movements of the participant,
- Position trackers to measure the location and orientation of the head and perhaps other objects,
- 3-D sonification for creation of an aural environment, and
- Voice recognition equipment.

Research into VR is using visual, aural and haptic senses to explore and navigate through large data spaces. Many of the large data sets associated with the ASCI program are very large and difficult to analyze. Research into the use of VR as a data analysis tool is being researched in hopes that it might provide an alternate data analysis method.

The CIC-8 high performance visualization team is developing and implementing an integrated software system comprised of both custom written software and commercial products to manage a 3-D

immersive environments. The environments include stereo visualization to head-mounted display devices, desktop screens and large screen displays such as the Fakespace immersive workbench using liquid crystal shutter glasses. The use of sound in a synthetic environment is being tested to determine whether the use of sound can aid with navigation in an immersive environment.

A variety of "manipulation" tools, such as, pinch gloves, 3-D mouse, 3-D wand interfaces, allow for direct manipulation of the data. The visualization team is also experimenting with various force feedback devices (haptic devices).

Visualization/Video Laboratory

The Visualization/Video Laboratory can help you sort through the many choices available to leverage this powerful technology efficiently. Visualization/video services include the following:

- Consulting and assistance on visualization tools, techniques, software, and methods;
- Coding of specialized routines for project-specific goals;
- Interactive recording sessions directly from workstation screens;
- Editing, titling, and audio dubbing of visualization videos;
- Creation of digital video for delivery via the Internet; and
- Translation between various graphics file formats.

Work in the Visualization/Video Laboratory relies on a mix of software from three categories: locally developed, freeware/shareware, and commercial. A list is also maintained of the various software in use at visualization laboratories around the country.

Table 8.2. ICN Accounting Information

Utility	System Access	Function	Options and Features
Recharge	Web	Retrieves account information from “use” databases.	Interactive; permits accessing information by system, user, etc.

Table 8.3. ICN Online Help Information

Facility	System	Function	Options and Features
WWW	Local	Browse LANL or the Internet.	Use Netscape browsers.
MAN	UNIX UNICOS	Quick reference information about utilities and command syntax.	Lists commands and keywords. Displays information for commands.
CLAMDOC	UNICOS	Mathematical library information.	Retrieval by routine name, category, or keyword.

Table 8.4. Text Editors

Editor	Systems	Key Options
VI	UNIX	Standard UNIX editor, multiple file access, subset of EX editor.
Visual Editor	UNICOS	Automatic indent and tab set.
EMACS	UNICOS cluster	Cray supported
FRED	All	Standard ICN line editor, DO loop extensions. Strong command set Conditional IF functions.

Mathematical Software Libraries

CIC Division maintains a large and valuable collection of mathematical and statistical software. Many of the libraries mentioned below are available from the “netlib” facility at Oak Ridge National Laboratory. Any source code available through this Web interface is free of charge, but it will not be guaranteed.

Below is a list of Los Alamos’ mathematical and statistical libraries that are available on various computers maintained by CIC Division. After the list you can find discussions on Common Los Alamos Mathematical Software (CLAMS) and International Mathematical and Statistics Library (IMSL) in the next two sections.

- Eigensystem solvers—EISPACK (in CLAMS)
- Linear Equation Solvers—LINPACK (in CLAMS)
- Nonlinear Equation Solvers—MINPACK (in CLAMS)
- Ordinary Differential Equations—ODEPACK (in CLAMS)
- General mathematics and statistics—IMSL (on Cray PVPs)

Common Los Alamos Mathematical Software (CLAMS)

The philosophy of CIC Division is to provide and maintain a common library of all supported mathematical software routines. Mathematical software libraries for the major ICN systems are built from this common source. CLAMS is a result of this philosophy.

The CLAMS library contains all of the routines in the SLATEC Common Math Library as well as routines unique to Los Alamos. The CLAMS library and associated documentation is on the CIC Division “icn-tools” information server. Currently supported platforms are as follows:

- Cray UNICOS,
- DEC Alphas running Open VMS,
- HP series 700,
- IBM RS 6000,
- Silicon Graphics, and
- Sun.

By mounting the appropriate files from “icn-tools,” you will have access to the latest version of CLAMS without using local disk space. CLAMDOC is an interactive on-line documentation program that provides retrieval by routine name, category number, or keyword(s). The utility may be accessed by entering the command “clamdoc” at your terminal. On the DEC machines, the on-line documentation utility “clamdoc” is available. On the UNIX machines, “clamdoc” and the “man” pages for both CLAMS and clamdoc are available. To access files on “icn-tools,” contact your local system administrator. Find this software on the Web.

On UNIX systems, assuming that the files exported from “icn-tools” are in /usr/lanl on the local machine, you should have /usr/lanl/bin in your path variable, /usr/lanl/lib in your LD_LIBRARY_PATH environment variable, and /usr/lanl/man as your MANPATH variable. On Sun workstations, you should be using /mathlib/clams/unix.

On CFS under /ccx/sun you will find “clams.tar” and “clamdoc.tar.” Use the command “untar” and check out the “readme” or “make” files. The SLATEC source is available from the Web.

CLAMS documentation is available on the Web at <http://www.lanl.gov/orgs/cic/cic8/para-dist-team/MATH/clams.html>.

International Mathematical & Statistics Library (IMSL)

IMSL is a commercial, proprietary subprogram library developed by Visual Numerics, Inc. It contains about 4000 FORTRAN subprograms that handle a

variety of mathematical and statistical problems. The documentation for the IMSL library can be accessed by the user command “imsldoc” on UNICOS.

The primary usefulness of IMSL for Los Alamos users is in its extensive statistical library, which includes data reduction, multivariate analysis, sequential analysis, random-number generation and probability distribution, permutations and combinations, subset generators, nonparametric statistics, and hypothesis testing. IMSL also provides some subprograms not available in CLAMS, such as operations on polynomial splines, elliptic integrals and functions, and methods for two-point boundary problems.

Parallel Object-Oriented Methods and Applications (POOMA)

Scientific application codes such as those that run on LANL’s Origin 2000 supercomputers are extremely large, complex computer programs that previously had to be painstakingly rewritten whenever hardware or software changed significantly. The POOMA framework is a software infrastructure designed to simplify the development of scientific application codes on parallel computer architectures.

Application codes written with POOMA are capable of running on serial, distributed, or parallel computer architectures with no changes to the code. Application developers express the fundamental scientific content and numerical methods of their problems using high-level language constructs similar to simple mathematical notation; they need not be familiar with the details of C++ object-oriented programming.

This framework is not only easy to use but also extremely agile and portable across rapidly evolving high-performance computing architectures. It can be used not only on parallel supercomputers, such as ASCI Bluemountain, but also on common scientific workstations.

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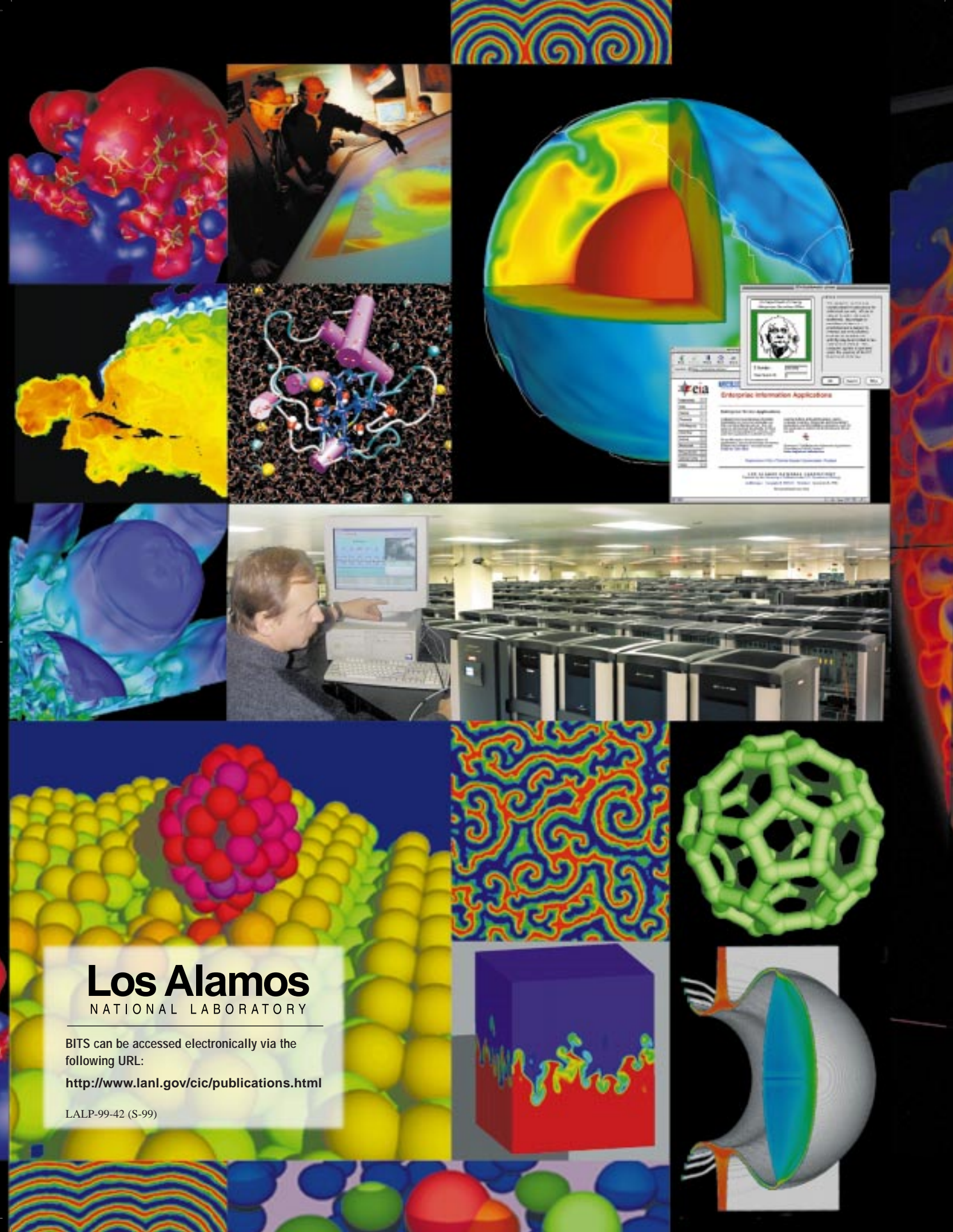
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